

## 27 February 2010 Chile Tsunami Post Event Survey Mission

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**Abstract**

This report describes the tsunami survey performed in Chile, 1 month after the 27 February 2010 Mw 8.8 Chile earthquake. The survey was done in the frame of the International Tsunami Survey Team in Chile (ITST-Chile), under the UNESCO coordination.

The primary aim was to collect data for assessing the accuracy of tsunami inundation models and to understand the complex nearshore wave dynamics that may affect tsunami inundation and run-up as those relate to damages on buildings, infrastructure and the natural environment.

The report also describes the methodology followed during the survey and the background information necessary to understand the measurements collected during the survey; a brief description of the Field Reporting Tool, used during the mission, is included.





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## 1 Introduction

On 2/27/2010 6:34:17 AM UTC an earthquake of magnitude 8.8 and depth 59.4km struck a moderately populated area in the Bio-Bio Province (population: 1.7 million) in Chile. The earthquake epicentre is estimated at approximately 116 km west of the city of Concepción. A train of tsunami waves were generated at the source in the 3-4 hours following the earthquake. The tsunami was recorded in several countries surrounding the Pacific Ocean and some reported damage but the severity of damage was observed in locations close to the epicentre and along the rupture zone for a distance of about 700 km.

In the period between 27<sup>th</sup> and 30<sup>th</sup> of March 2010 the survey team composed by A. Annunziato, G. Franchello and A. Barberopoulou conducted a detailed survey in the coastal areas of Chile hit by the 27 February 2010 tsunami. It was extremely important to perform the survey soon after the event (about 1 month) because some of the most important marks left by the tsunami in these areas, are usually erased during the recovery period when most of the construction and cleaning activities are taking place.

The mission was conducted in the frame of the International Tsunami Survey Team (ITST) that was coordinated by UNESCO. In this context, all the data collected by this mission will be part of the overall tsunami assessment. All the data collected are extremely useful and we hope they will make a significant contribution to the improvement of tsunami inundation models.

The mission was performed as follows:

### 26 March, 2010

Briefing at UNESCO. Seventeen scientists were attending representing Humboldt State Univ. (USA), Georgia Tech. (USA), USC (USA), NOAA, UNESCO, Chile University and the European Commission (Joint Research Centre). Pictures and preliminary findings of the preceding surveys and guidelines were discussed during the meeting. The groups that had already completed the survey presented the most important findings of their surveys and other things of importance to the departing teams. UNESCO staff also explained the framework of the activity and what needs to be accomplished through ITST. This initial briefing was very important for groups like ours that had minimal post-tsunami field surveying experience.

### 27 March, 2010

Departure from Santiago to Lloca. Survey of Lloca and surrounding areas. Transfer from Lloca to Constitución.

### 28 March, 2010

Surveyed cities of Constitución, Pellufo, Curanipe, Cauquenes and transferred to Concepción.

### 29 March, 2010

Surveyed the city of Talcahuano, the Bio Bio river estuary, and the towns of Lota, Laraquete and Arauco.

### 30 March, 2010

Surveyed the towns of Tomé, Coliumo, Dichato before returning to Santiago.

### 31 March, 2010

Debriefing at UNESCO headquarters in Santiago.

The span of the surveyed coast was about 250 km and a total of 2700 km distance was covered during this survey. The results of the mission are summarized in the map below (Figure 1) that indicates all the points measured during this trip.

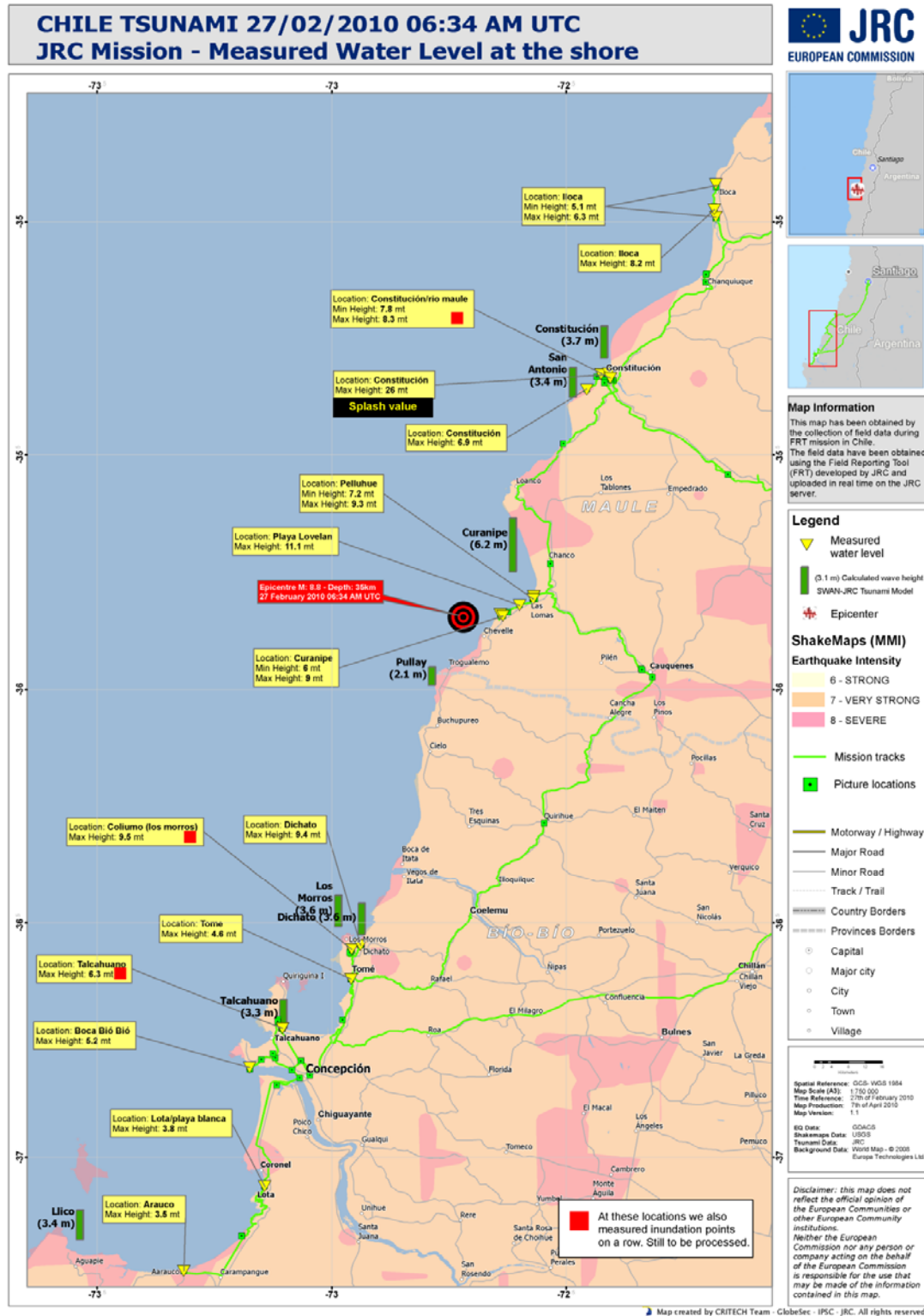


Figure 1 - Outline of the measurements performed. Draft map produced at the end of the mission.

## 2 Work Methodology

The methodology followed was refined in the course of the survey mission.

### 2.1 Equipment

The equipment our team used to collect data consisted of

- 4 Personal Digital Assistant devices (electronic handheld information device) or PDAs equipped with the Field Reporting Tool (FRT) software for collecting tracks, events and metadata (see chapter 5)
- 1 Ricoh Camera with GPS, 8 Megapixels
- 1 Nikon camera, 3 Megapixels
- 1 Nikon camera", 6 Megapixels
- 1 extensible measuring bar up to 5 m
- A Trimble laser for height measurements up to 200 m horizontal distance
- A tripod for use with the Trimble device
- Several batteries for the PDAs and cameras

In summary we have collected:

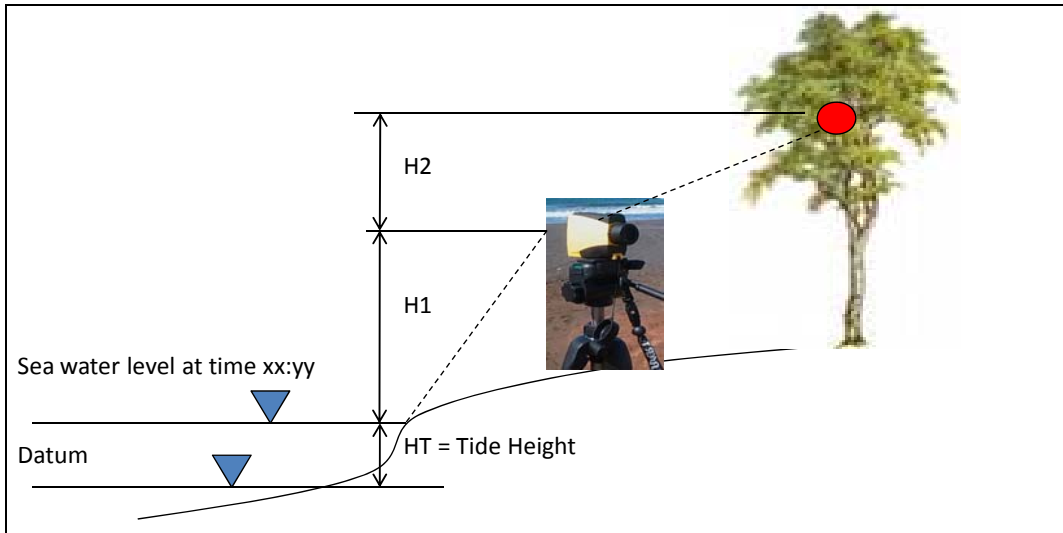
- 220 "events" geolocalized, 100 of them with complete height measurements
- 267 images geolocalized by the GPS camera
- 388 images geolocalized using the tracks obtained by the FRT and using the time of the picture as a reference point.

### 2.2 Measurements

For the measurement of the tsunami water level-or height of wave above sea level- two pieces of information were needed at each point of measurement: the current sea level that needed to be set in advance of each measurement (H1) and the height measurement (H2). The Trimble device was used for this purpose (Figure 2) using a point where specific tsunami marks could be found such as algae deposited on trees, dirty marks found on the walls of houses, or debris on the field transported by the waves (Figure 3).



*Figure 2 - Trimble device*



**Figure 3 - Measurement technique**

The reported water height is given by the sum of three quantities as given by the formula  $H=H1+H2+HT$ , where HT is the tidal height at the time the picture. The tidal height is obtained using the programme Xtide (<http://www.flaterco.com/xtide/>). The programme contains a database with a limited number of localities.

The locations below were considered as representative of the various areas (See Appendix A):

- Constitución, Rio Maule
- Curanipe
- Talcahuano
- Coliumo
- 

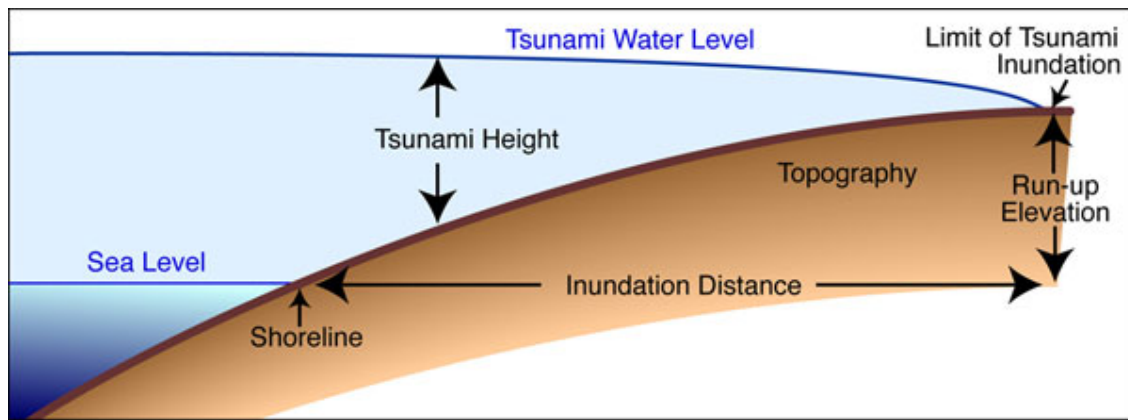
## 2.3 Interviews

Several interviews were obtained from local people in order: a) to collect information difficult to collect through measurements alone; b) to verify already collected data such as number of tsunami waves, arrival time of the waves, the size of the waves, details about personal or community response and other general information about the event.

Although the command of the Spanish language of our team was at the level of basic communication, with the help of occasional translators, the use of Italian language appeared sufficient for obtaining the information we wanted. Some interviews were also recorded and later translated.

## 2.4 Notes

Several notes were also collected and recorded using the FRT capabilities.



*Figure 4 – Tsunami glossary terms*

## 2.5 Terminology

Through this document we use several terms that may not be self explanatory to the general reader. We refer to the following Figure 4 for defining few commonly used terms:

- the tsunami water level (WL), sometimes referred as “inundation height”, is the level of the disturbed water level and is measured as the difference between the tsunami disturbed sea with respect to the water at equilibrium;
- the tsunami height (WH), sometimes referred also as “flow depth”. This measurement is done along the shore and needs to be add to the elevation (EL) of the measurement point to get the tsunami water level ( $WL=WH+EL$ );
- the runup elevation, or plainly runup, point of highest elevation corresponding to maximum inundation (meaning largest distance from the shoreline that the tsunami reached): at runup point the flow depth or the water height is zero.



### 3 Surveyed Locations

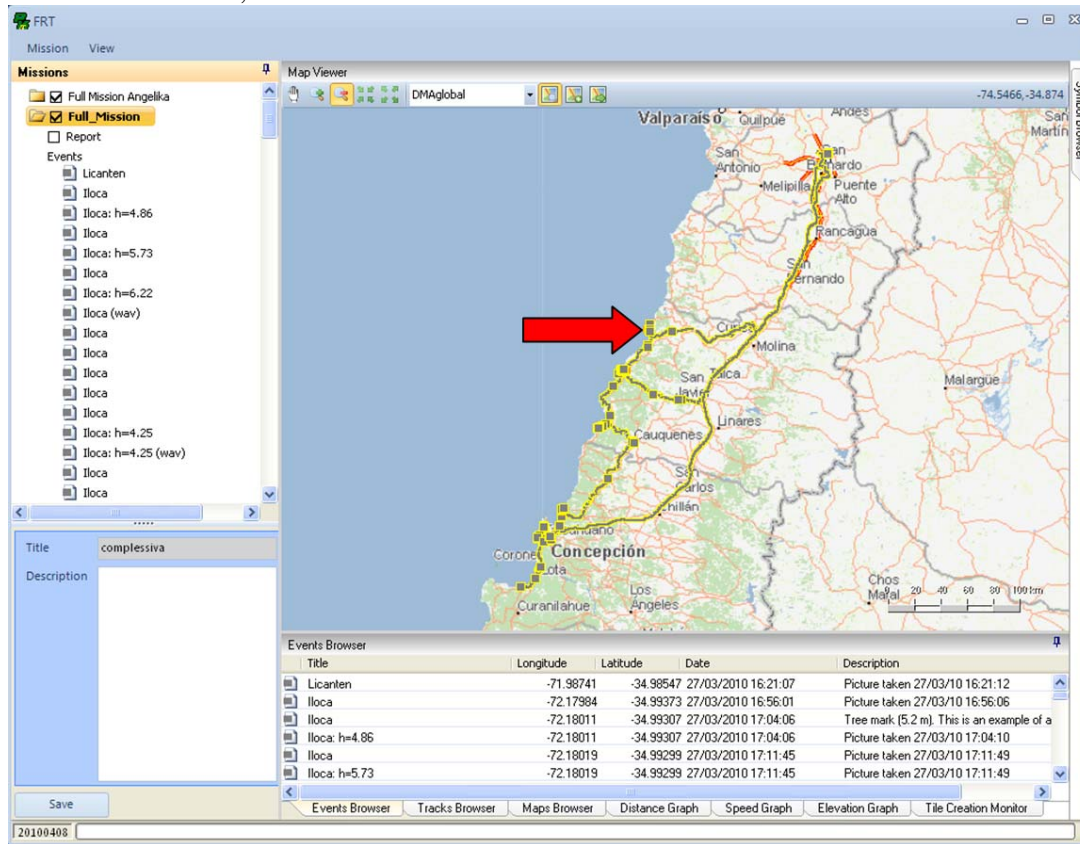
The list below shows the surveyed locations where tsunami inundation measurements were possible

- Desembocadura del Mataquito
- Lloca
- Chanquiuque, playa la Isla
- Constitución
- Pelluhue
- Playa Lovelan
- Curanipe
- Talcahuano
- Boca Bio Bio
- ENAP Refinery in Talcahuano
- Lota and Laraquete
- Arauco
- Tomé
- Coliumo
- Dichato

Other locations were visited too. All the data points can be found in Appendix B.

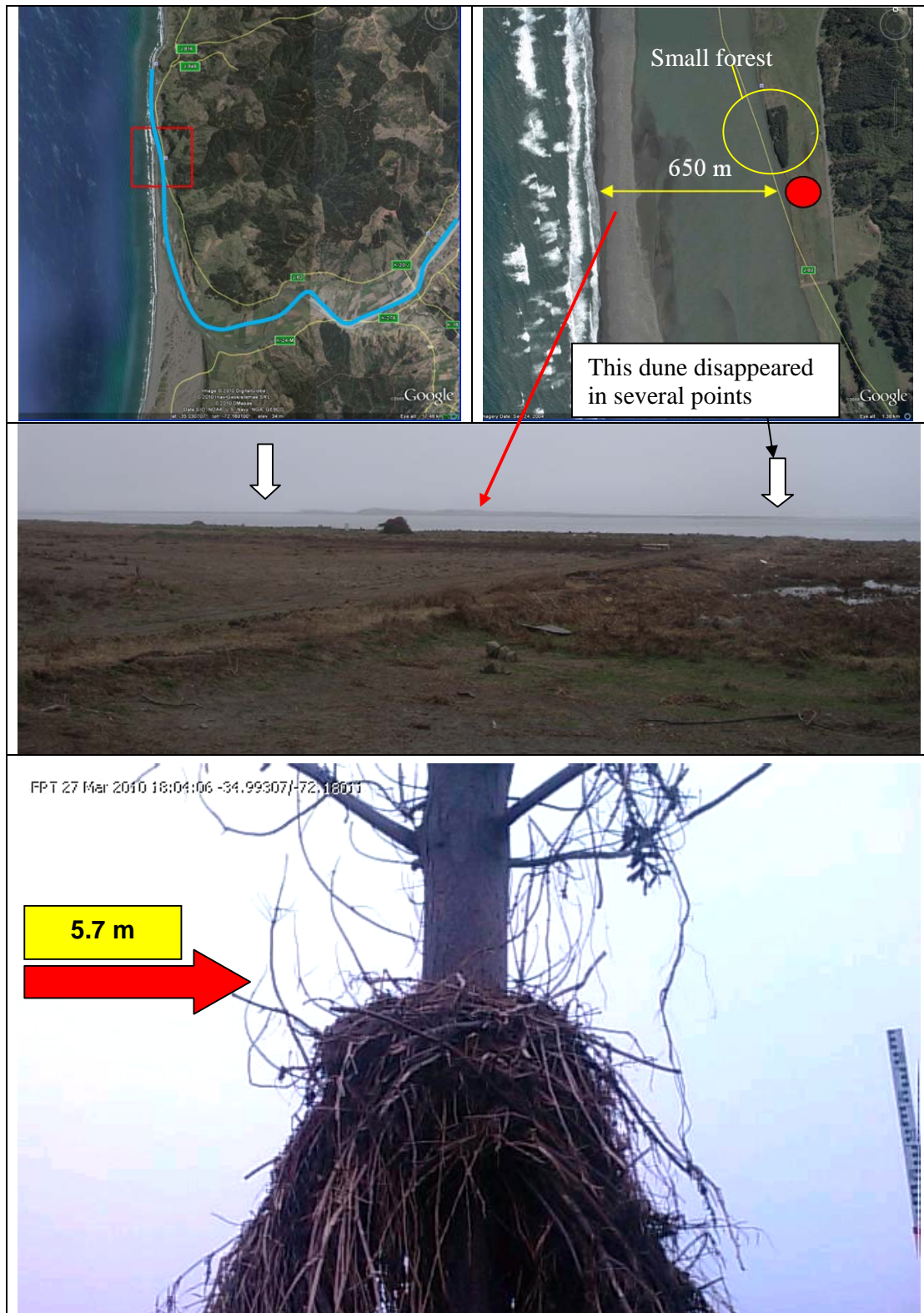
### 3.1 Desembocadura del Mataquito

Lon/Lat:  $-72.1801^0$ ,  $-34.99307^0$



The first surveyed location was Desembocadura del Mataquito, near a river estuary with a flow in the direction south to north and parallel to the coast between latitudes  $-35.06^0$  and  $-34.97^0$ . The measurements were taken at approximately 650 m away from the shoreline at a place where the dune was strongly degraded allowing the ocean water to reach as far inland as the red point (see Figure 5). The dune is hardly identifiable in the pictures as several sections of it have been eroded.

The lower branches of some of trees still carried tsunami deposits and broken branches could be identified. The beach erosion due to the tsunami killed most of the trees of the small forest that is visible in the pre-image below. Only few trees have survived. Based on the evidence we estimated that the tsunami height in this location was of the order of 5-6m (Figure 5 and Figure 6)

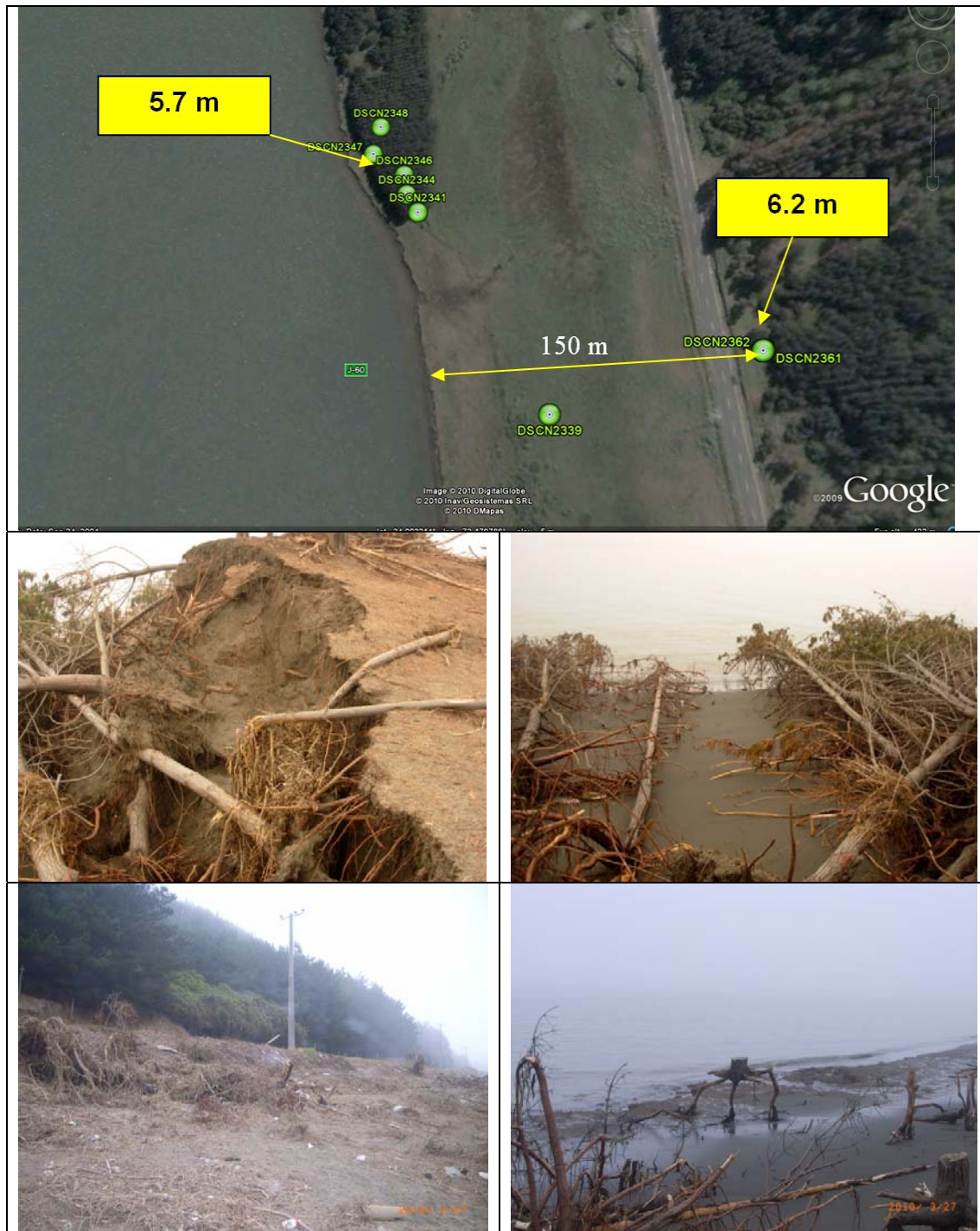


**Figure 5 – Top image: location where the measurements were taken. Middle image: the residual shore which disappeared in several sections. Lower image: example of tsunami debris found on a tree**



*Figure 6 – Relative comparison of height of a team member with tsunami deposit height*





**Figure 7 – Top image: inundation field. Bottom image: Beach erosion and resultant dead trees**

The tsunami waves completely inundated the flat area beyond the road which is at about 3m height with respect to undisturbed water level. The maximum inundation distance measured at this location was in the order of 150 m from the river bed, which now represents the new shoreline (see Figure 7).

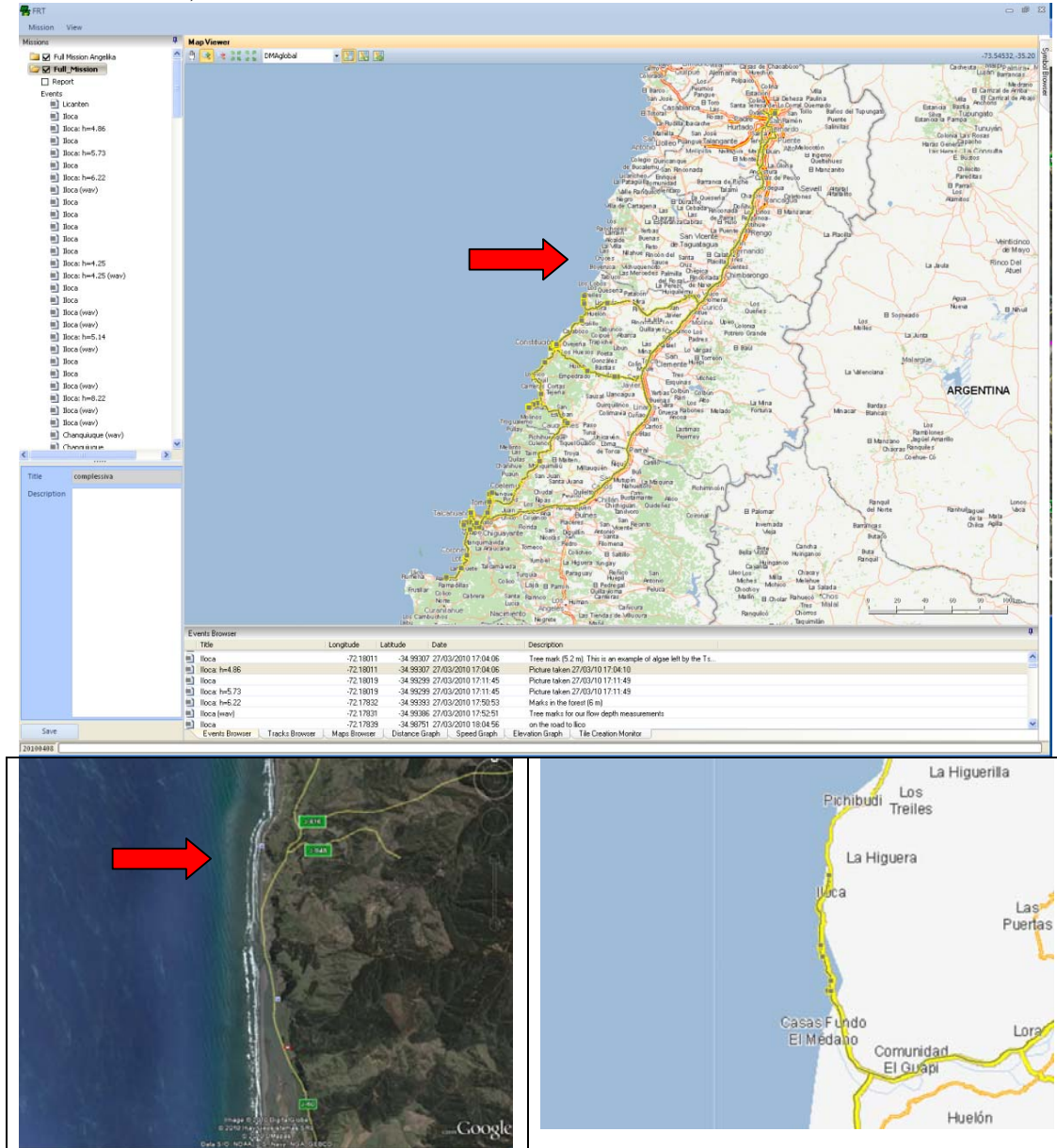
The erosion on the small dune with the planted trees (see pre-satellite image by Google) was relevant. As we move away from the beach we find evidence of flow in opposite direction based on the surviving plants. Although, it is difficult to see in the pictures, a clear defining line between these plants suggests complicated flow around the beach. Moving away from the beach and beyond the road where elevation is increasing rapidly we find evidence of inundation where the tsunami cleared tree leaves from the ground but left them where elevation was higher than the runup.

ID	Date/Time	Longitude	Latitude	Tidal height	Meas. Height	Water Height	Type
3	27/03/2010 17:04	-72.1801	-34.99307	0.36	5.0	5.4	Inundation
4	27/03/2010 17:04	-72.1801	-34.99307	0.36	4.5	4.9	Inundation
6	27/03/2010 17:11	-72.1802	-34.99299	0.33	5.4	5.7	Inundation
7	27/03/2010 17:50	-72.1783	-34.99393	0.22	6.0	6.2	Run-up

*Table 1 – Measurements from Desambocatura del Mataquito*

### 3.2 Lloca

Lon: -72.1842, Lat: -34.96815



The measurements taken in Lloca lie between latitudes  $-34.97^{\circ}$  and  $34.96^{\circ}$ , corresponding to about 1 km of coast. Several small houses were at small distance from the shore. Large house destruction was a common sight in this location (see Figure 9).

Local people (at Lat/Lon:  $-34.96815/-72.18415$ ) were interviewed: “we have seen 3 waves after the earthquake arriving at 5min, 20 min, 30 mins apart. The 1st wave did not reach the road, the second did reach the road and the third to the top, at the base of the small pile of gravel. In front of the beach, there was a dune of sand that now is gone” (see Figure 8)

The first wave arriving 5 min after the earthquake does not seem realistic and is not consistent with other interviews. Other survey teams noted discrepancies between interviews and insisted on asking as many eyewitnesses as possible. Hopefully by comparing the findings of the various teams such discrepancies can be resolved. Another interview with a policeman on his horse indicated that



*“20, 25 and 30 minutes was the time between the arrival the first 3 waves. Carabineers alerted all the people there.”*



**Figure 8 – Measurements in Lloca**

	
<p>A lot of damage was observed in houses north of Lloca</p>	<p>Destroyed church. Water mark inside the church was at 0.7m from the base of the building to water mark (flow depth). Most of the damage around here is due to the tsunami and not the earthquake</p>
	 <p>This is the 2<sup>nd</sup> floor of another house that has been detached and relocated</p>
	
<p>Note: the lower two images relate to the same house located at -34.9265/-72.1797. Measurements made outside the house (see next image) indicate a tsunami height of 5.14 m. In reality, the water level inside the house was higher than that because the water lifted the roof. Evidence of this are the towel and pillow seen on the image below right that were caught between the roof and the wall while the roof came back down as the level of the water decreased. The first floor of the house had a broken window and tsunami marks. The overall height from the evidence collected inside the house could be estimated to at least another 1 m (6.15 m). <i>This height is an approximation that is not based on any equipment measurement and it would be interesting to see if other groups that visited this location could provide a more accurate estimate.</i></p>	

**Figure 9 – Series of images from Lloca**



**Figure 10 – Interview with a witness**

Figure 10 shows *Eduardo Alcaino*, the owner of the house, interviewed by a team member outside his house. Mr Alcaino is an engineer living in Santiago but was in Lloca at the day of the earthquake. He said that in the construction of the house he reinforced some of the walls and he considered a section of the house as “*the safe place in the house*”. According to him the wave arriving was like a wall of water (bore). The speed of the water was compared to slow running. He escaped to the hill with his family by car, during the earthquake. He also noticed waves moving parallel to the coast with a direction from north to south before the receding of the water happened and then the 1<sup>st</sup> wave arrived. He was observing the wave activity from the top of the hill. Estimation of the water level was very difficult.



**Figure 11 – Measurement of water level using the evidence of tsunami flow on the wall of a house**

Punta Roncura is a location close to Lloca; it is a steep point where we measured rather high water level (8.2 m, Figure 12 and Figure 13). The measurement was made next to a house located on a cliff. The sea level in front of the cliff is rather shallow and represents the original mouth of the river which now has been quite modified.



*Figure 12 – House with pillars*





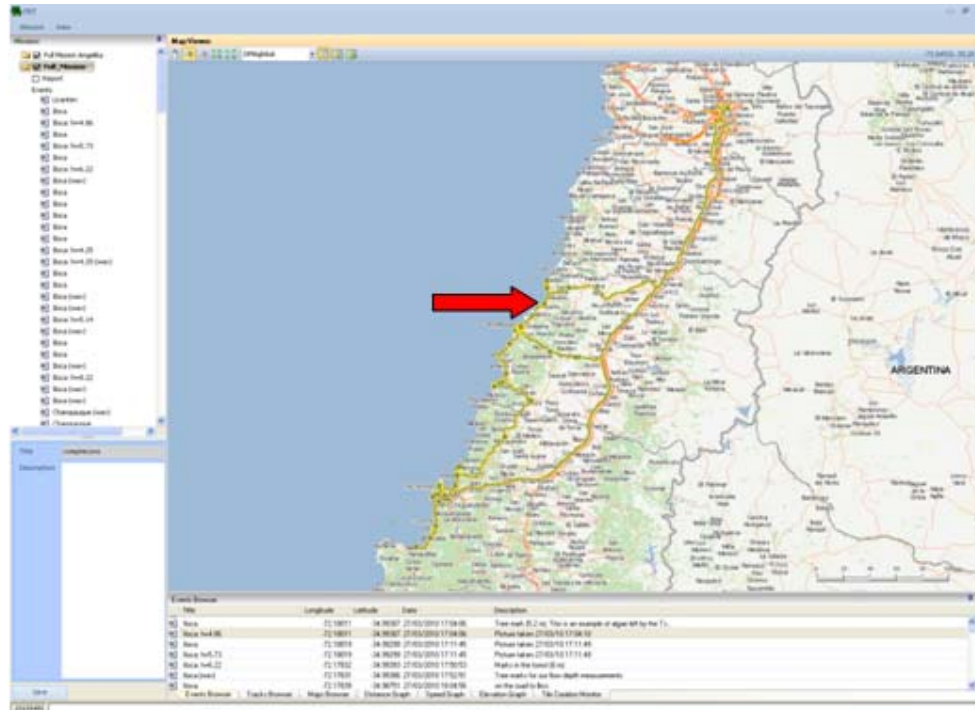
*Figure 13 - Measurements from Lloca*

ID	Date/Time	Longitude	Latitude	Tidal height	Meas. Height	Water Height	Type
14	27/03/2010 18:26	-72.1842	-34.96815	0.1	4.1	4.2	Run-up
20	27/03/2010 19:20	-72.1797	-34.9265	0.1	5	5.1	Run-up
25	27/03/2010 20:02	-72.1834	-34.97367	0.2	8	8.2	Inundation

*Table 2 - Measurements from Lloca*

### 3.3 Chanquiuque, Playa la Isla

Lon: -72.1998 Lat:-35.11104



In the area of Chanquiuque, in Playa la Isla, a number of measurements and pictures were taken. This is a location relatively far from the shoreline (500 m). Large deformation was present in this area and observed along the road, that has been temporary rebuilt.

The measurement taken is listed in Table 3.



*Figure 14 – Top images: road destroyed by earthquake, Bottom: measurement on a tree*

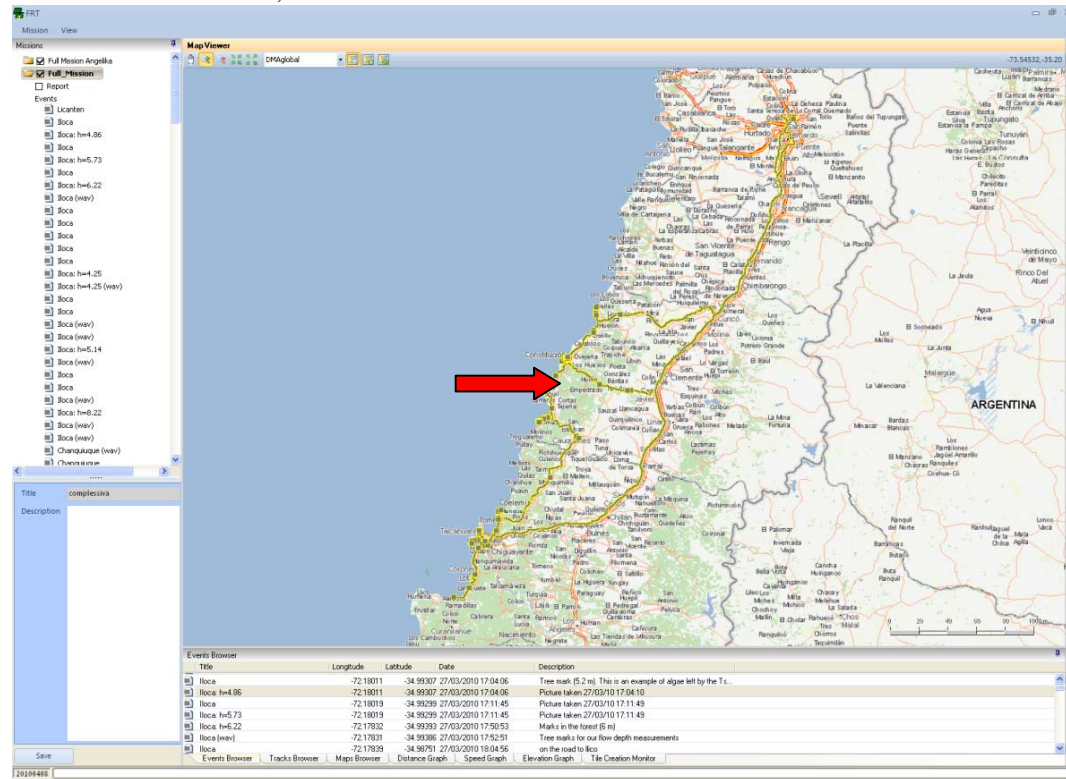
ID	Date/Time	Longitude	Latitude	Tidal height	Meas. Height	Water Height	Type
30	27/03/2010 20:38	-72.1998	-35.11104	0.32	4	4.32	Run-up

*Table 3 - Measurement from Chanquiuque*



### 3.4 Constitución

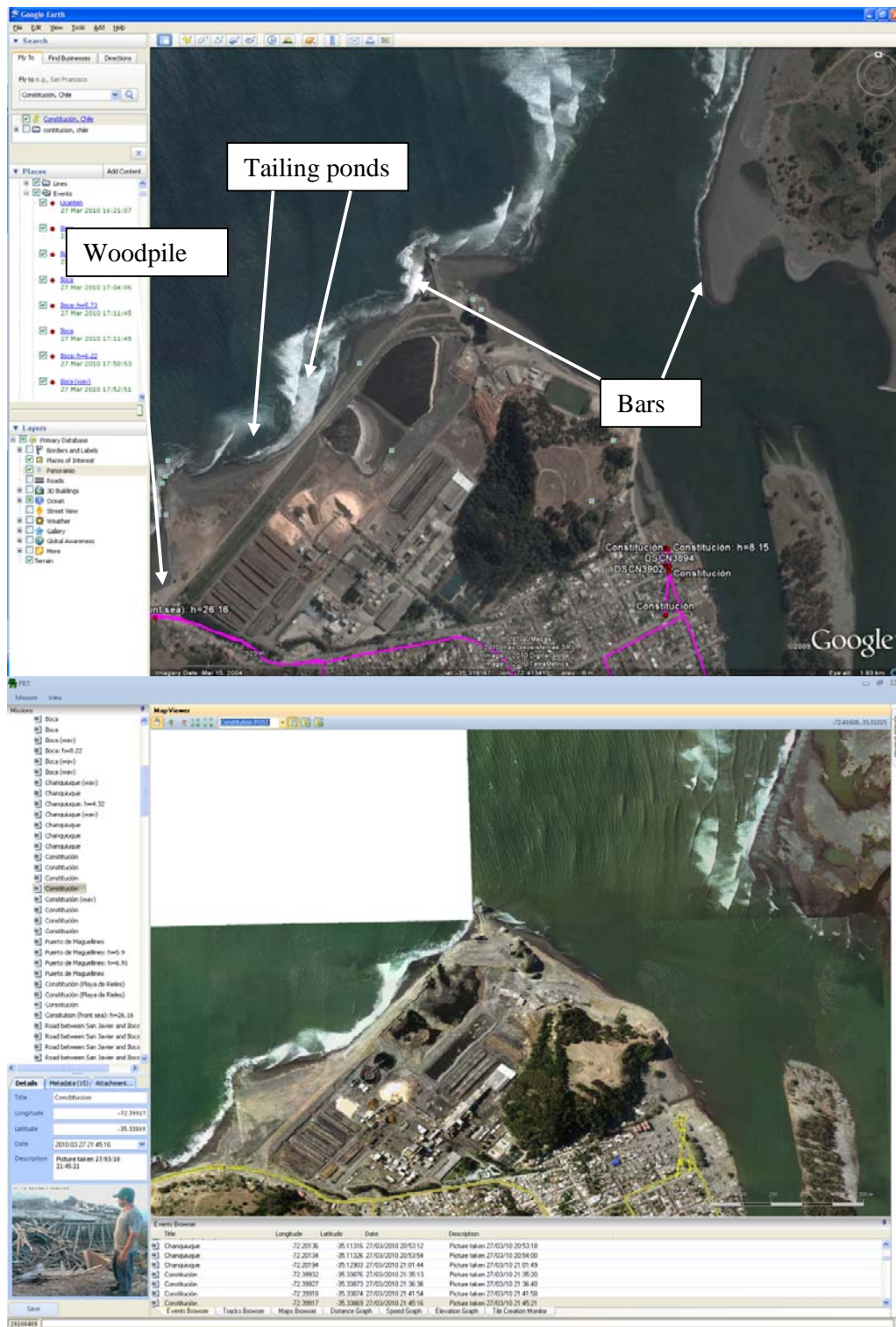
Lat/Lon: -35.339056°, -72.413837°



Constitución is located west of the Rio Maule estuary (see Figure 15). Prior to the tsunami arrival there were two types of sedimentary deposits (*bars*) on the sides of the river estuary. Such *bars* offered a natural barrier from tsunami waves. Tsunami waves reached a height of 12 m in the island at the river mouth (according to a fisherman we interviewed) while on one side of the river we measured water height in the order of 8 m.

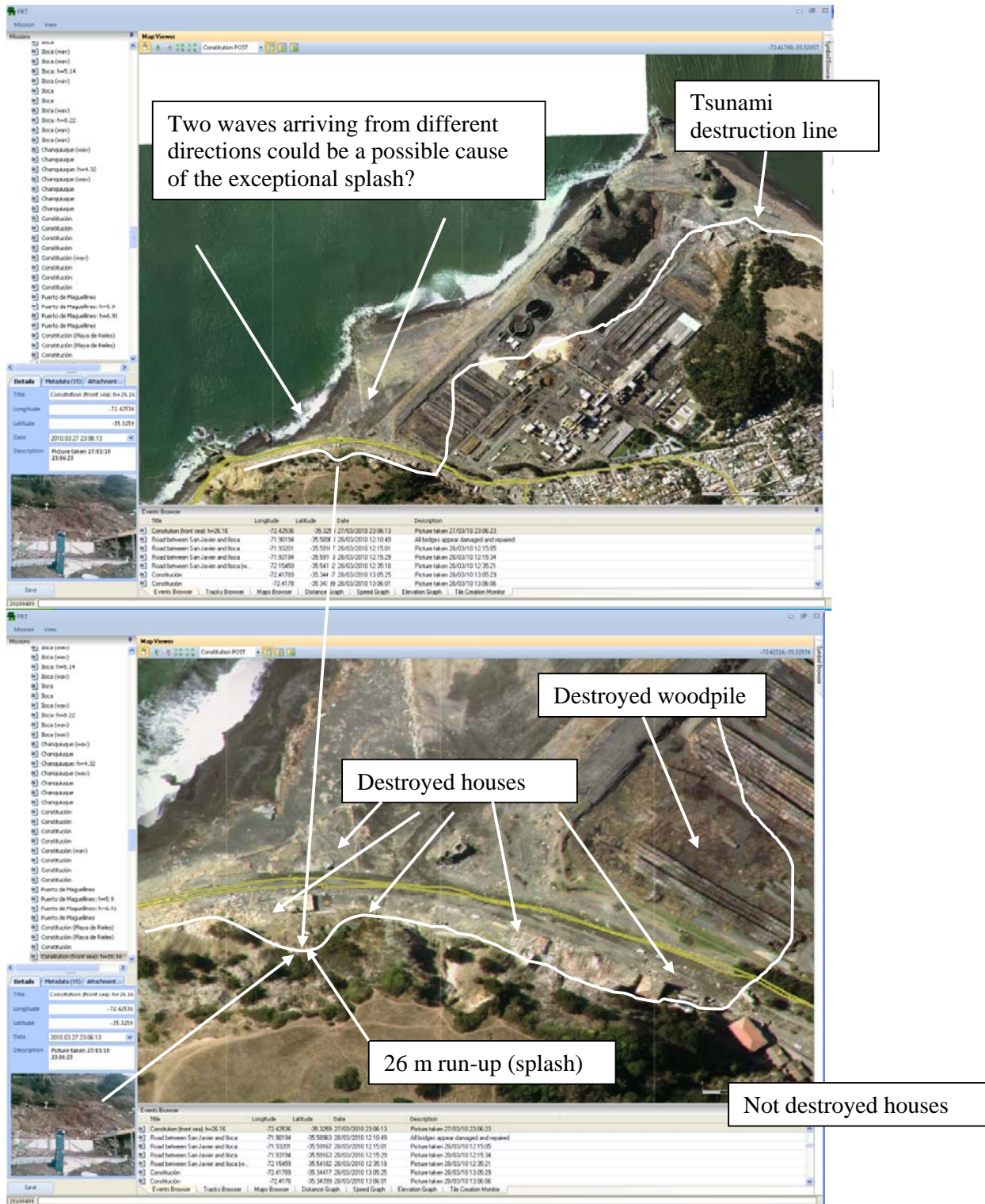
An exceptional run-up measurement of 26 m was made upstream Playa de los Gringos, close to a wood-processing plant (probably a paper factory). Only a few buildings on the Northeast side and two tailing ponds on the north were destroyed by the tsunamis (see Figure 16). A woodpile on the west side of the factory, close to the point of high run-up, was destroyed too. As we headed upstream, several houses were destroyed along a length of about 500 m. East of of this line of destruction, the houses were still standing. In conclusion, based on the observations and measurements in this area it seems that the 26 m run-up is a pretty local phenomenon, and contained in a small area that extends no more than 100 m. A possible explanation for the higher value measured here could be constructive interference of two waves arriving from different directions (2D effects).

Along the coast, 5 km south of Constitución town on the Port de Manguellines (see Figure 17), we measured an inundation height of about 8 m.

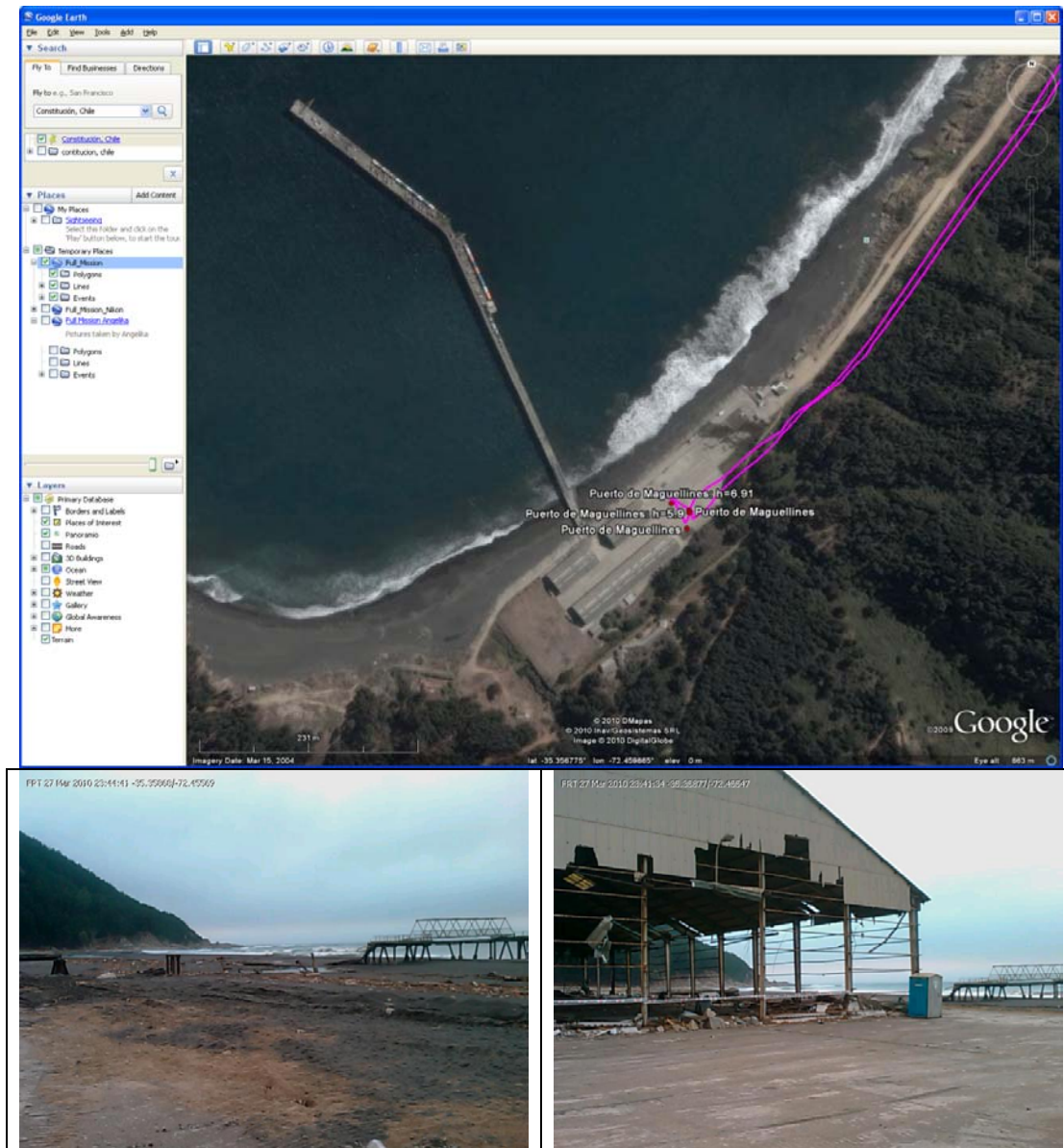


**Figure 15- Constitución. Google image prior to the tsunami (top) and satellite image after the tsunami (bottom). Note the bars at the river mouth (top) which were completely inundated by the tsunami (bottom).**





**Figure 16 - The maximum run-up was measured in Constitución. This exceptionally high runup is localized in a very small area.**



*Figure 17 - Puerto de Manguellines. The pier section of the beach was destroyed (left), while the metal shed indicates a tsunami height of 8 m at this location.*





**Figure 18 - North-East Constitución. Before (top) and after (bottom) the tsunami**

The majority of destruction in Constitución by the tsunami was found only on one of the sides of the Rio Maule estuary, on the north-east side of the town (see Figure 18), the most populated. We made two measurements of water height; one in the port authority building – damaged, but not destroyed -of 8.2 m and another - near a house -of 7.6m. The construction of many buildings included a combination of wood and sheet metal and as a result were completely destroyed and dispersed by the tsunami waves (see Figure 19).

Major destruction found in this area has to also be attributed to the strong ground shaking caused by the Mw8.8 earthquake. Many houses, are made of adobe a common material used in old houses as we move away from the urban centers. The resiliency of the tsunami-hit communities is measured also by the time it takes for them to recover. The coastal communities of Chile provide lessons for other coastal towns around the globe that are vulnerable to tsunami waves. The military is in large responsible for the fast recovery with impressive response to the impacted areas: teams of 300 soldiers in specific locations were working -cleaning the roads (see Figure 20). The military had completely cleaned other areas within a month. According to military personnel, the work started within approximately a week following the earthquake. The appropriate authorities had mobilised the military and police so as to provide the necessary human support for the cleaning and to provide other means of support such as water and tents or to prevent riots.



*Figure 19 - From left to right and then to the next row we see: still standing Port authority building, new house, and view of inundated area*



*Figure 20 - Earthquake destruction (left) and soldiers cleaning the roads (right)*

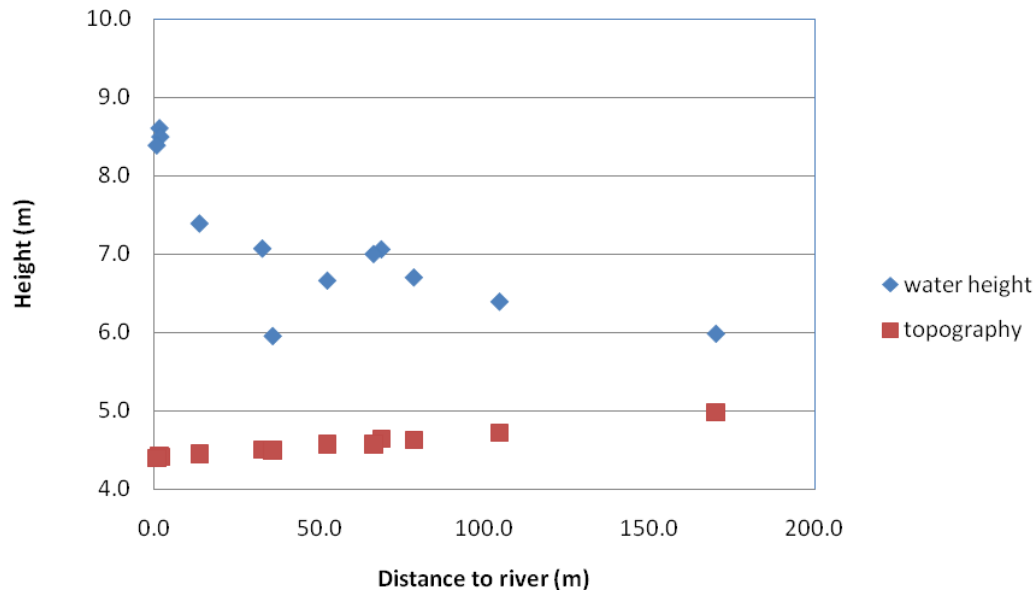


The water height profile normal to Mule River extracted by our measurements is shown on Figure 21 and Figure 22. In Table 4 the measurements in Constituc  n are summarized.



*Figure 21 - Water profile measurements*





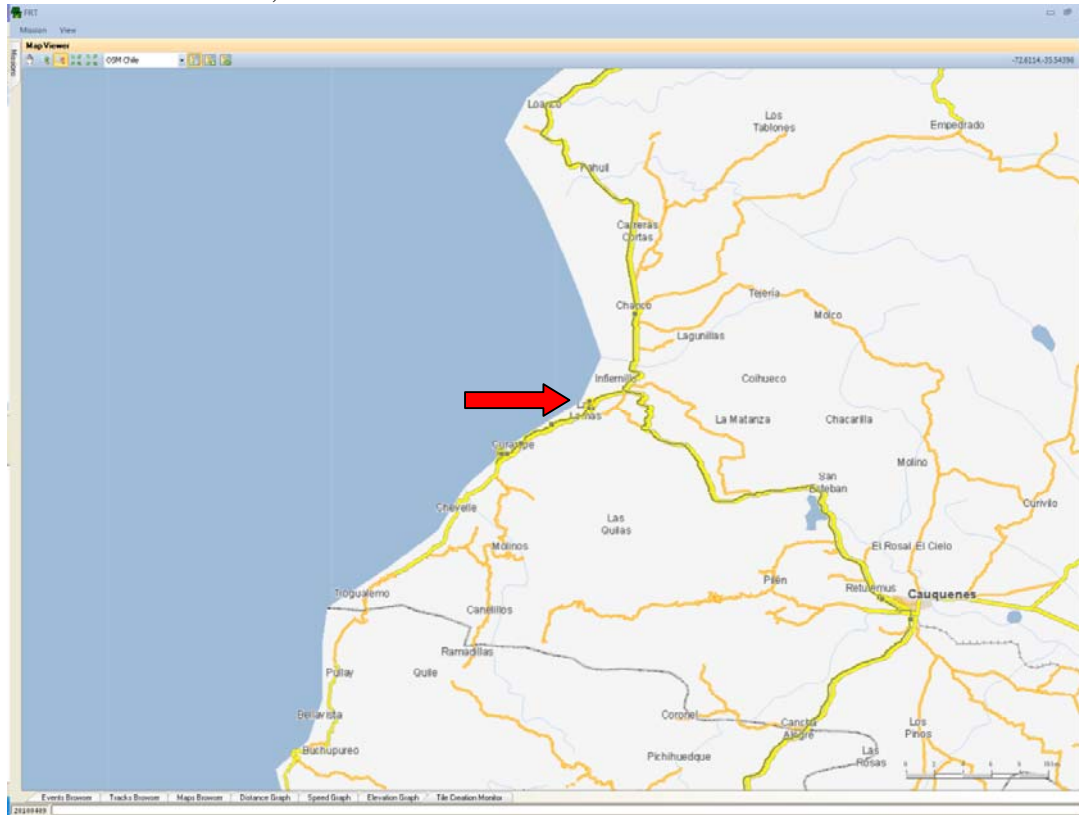
*Figure 22 - Water versus topography profile*

ID	Date/Time	Longitude	Latitude	Tidal height	Meas. Height	Water Height	Type
44	27 Mar 2010 22:41:34	-72.45547	-35.35877	0.9	7	7.9	Inundation
45	27 Mar 2010 22:44:41	-72.45569	-35.35868	0.9	6	6.9	Inundation
50	27 Mar 2010 23:06:13	-72.42536	-35.3259	1.2	25	26.2	Run-up
66	28 Mar 2010 13:48:15	-72.40508	-35.33421	1.4	7.2	8.6	Inundation
67	28 Mar 2010 13:51:44	-72.40509	-35.3342	1.4	7.1	8.5	Inundation
68	28 Mar 2010 14:00:17	-72.40487	-35.33463	1.4	7	8.4	Inundation
69	28 Mar 2010 14:12:50	-72.405019	-35.334594	1.4	6	7.4	Inundation
70	28 Mar 2010 14:14:59	-72.405279	-35.334482	1.4	5.7	7.1	Inundation
71	28 Mar 2010 14:16:01	-72.405464	-35.334554	1.4	5.3	6.7	Inundation
72	28 Mar 2010 14:17:21	-72.405566	-35.334712	1.4	5.7	7.1	Inundation
73	28 Mar 2010 14:20:54	-72.405142	-35.335123	1.4	4.6	6.0	Inundation
74	28 Mar 2010 14:35:05	-72.405549	-35.334693	1.3	5.7	7.0	Inundation
75	28 Mar 2010 14:36:39	-72.405606	-35.334883	1.3	5.4	6.7	Inundation
76	28 Mar 2010 14:38:40	-72.405863	-35.33493	1.3	5.1	6.4	Inundation
77	28 Mar 2010 14:42:13	-72.406483	-35.335141	1.3	4.7	6.0	Inundation
79	28 Mar 2010 15:13:33	-72.40882	-35.32413	1.2	7	8.2	Inundation
81	28 Mar 2010 15:20:29	-72.40892	-35.32412	1.1	6.5	7.6	Inundation

*Table 4 - Measurements from Constitución.*

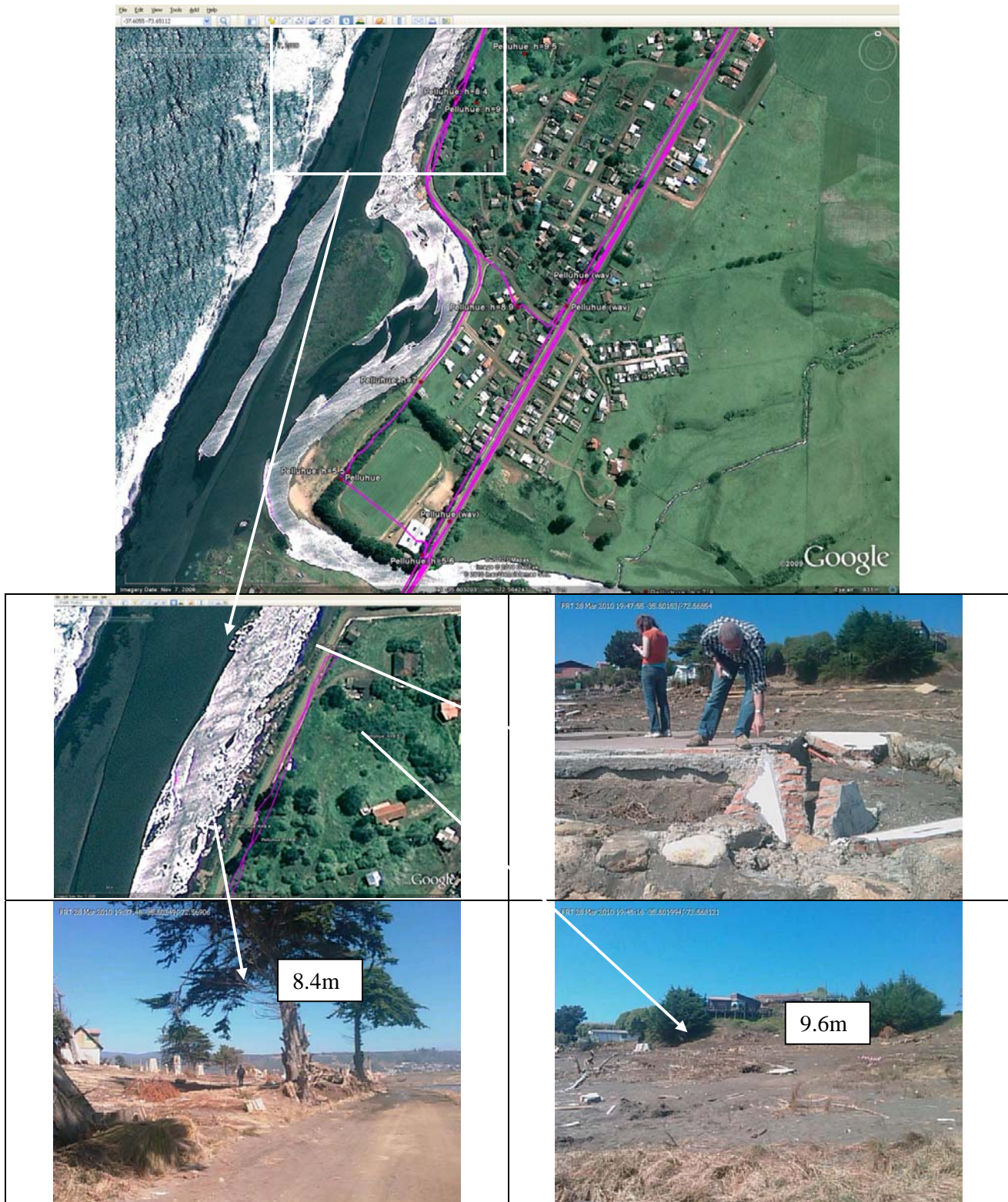
### 3.5 Pelluhue

Lat/Lon: -35.805690°, -72.567700°



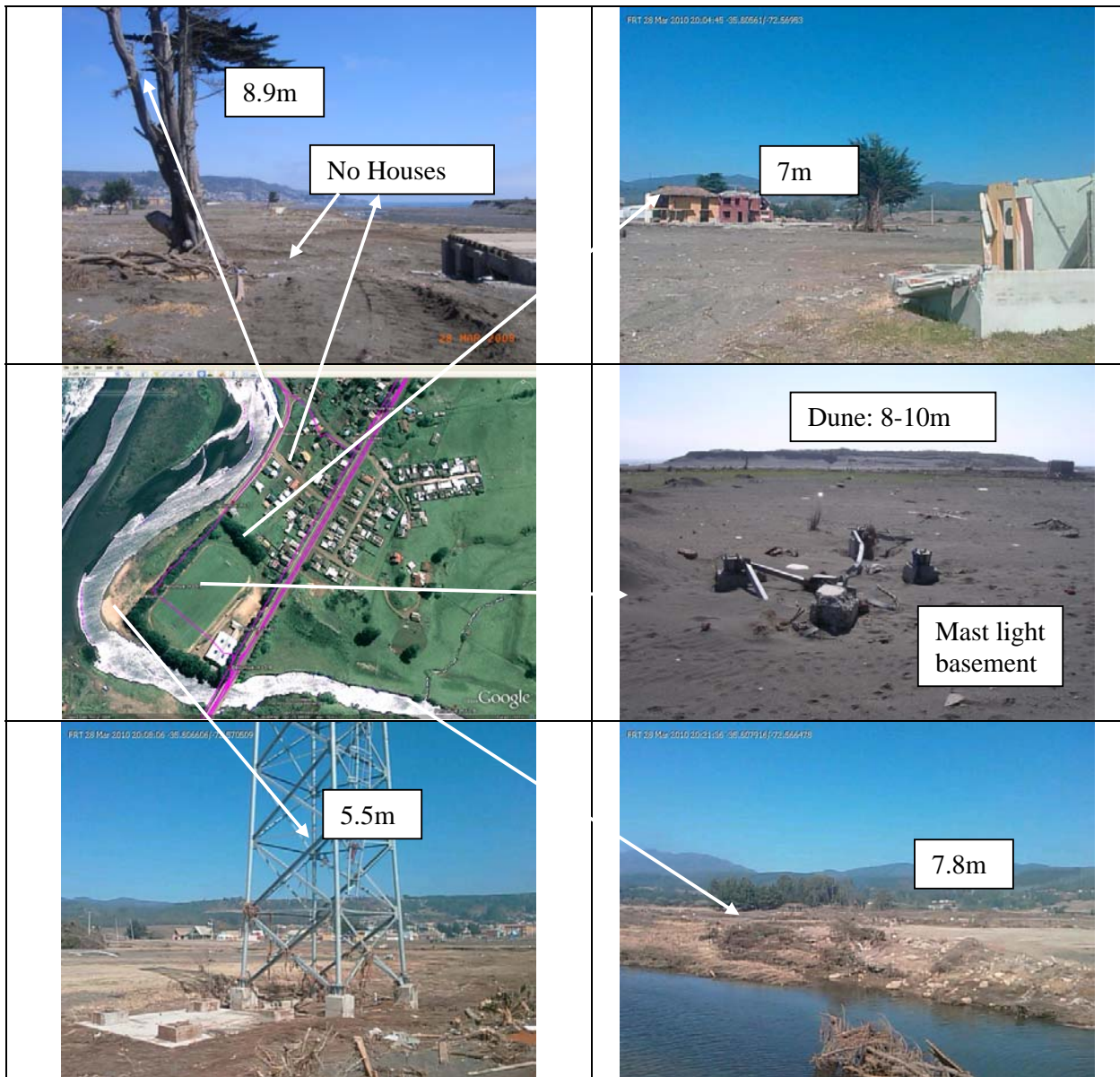
In Pelluhue we measured run-up in two points that provided the values of 9.6 m (about 200 m distance from the shoreline) and 7.6 m (about 600 m distance from the shoreline). Inundation height varied largely with respect to the position. In particular, 8.4 m value of inundation has been measured at a point close to the point where we measured a run-up value of 9.6 m (see Figure 23), and between 5 and 7 m downstream of a dune of about 8-10 m (see Figure 24).

Judging from the damage sustained by the houses and the mast light, the velocity of the water must have been very high. The bend grass on the dune indicated that it was completely inundated. This suggests that downstream of the dune the water reached high velocities at this location. On Table 5 the measurements from Pelluhue are provided.



**Figure 23 - Pelluhue north - Note the small building (upper right) of concrete and bricks that was completely destroyed.**





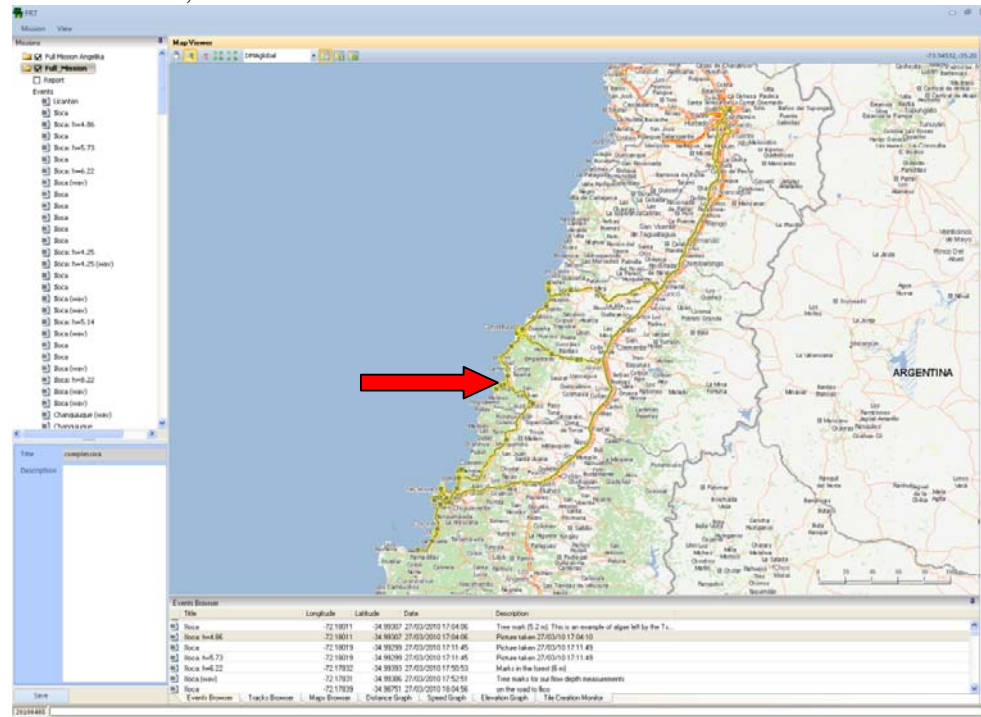
**Figure 24 Pelluhue Stadium - The houses near the road and the beach have disappeared. Two mast lights were destroyed; one was found relocated several hundred meters away. A community has not endured.**

ID	Date/Time	Longitude	Latitude	Tidal height	Meas. Height	Water Height	Type
91	28 Mar 2010 17:24:05	-72.56822	-35.80478	0.5	8.4	8.9	Inundation
92	28 Mar 2010 17:37:48	-72.56906	-35.80249	0.4	8	8.4	Inundation
93	28 Mar 2010 17:43:10	-72.568778	-35.802533	0.4	9.2	9.6	Run-up
94	28 Mar 2010 17:45:16	-72.568121	-35.801994	0.4	9.1	9.5	Run-up
96	28 Mar 2010 18:04:45	-72.56953	-35.80561	0.3	6.7	7.0	Inundation
97	28 Mar 2010 18:08:06	-72.570509	-35.806606	0.3	5.2	5.5	Inundation
99	28 Mar 2010 18:17:15	-72.569515	-35.807503	0.2	5.4	5.6	Inundation
100	28 Mar 2010 18:21:36	-72.566478	-35.807916	0.2	7.6	7.8	Run-up

*Table 5 - Measurements from Pellhue.*

### 3.6 Playa Lovelan

Lon: -72.5986, Lat: -35.82093



Playa Lovelan is located between the cities of Pelluhue and Curanipe and is a 1 km long beach with most of the houses at rather high elevation (see a 3D representation from Google Earth below with a factor 3 exaggeration in the height). The runup measurement of 11 m made at this elevation has one of the highest values we collected during this trip. The measurement appears on Table 6.





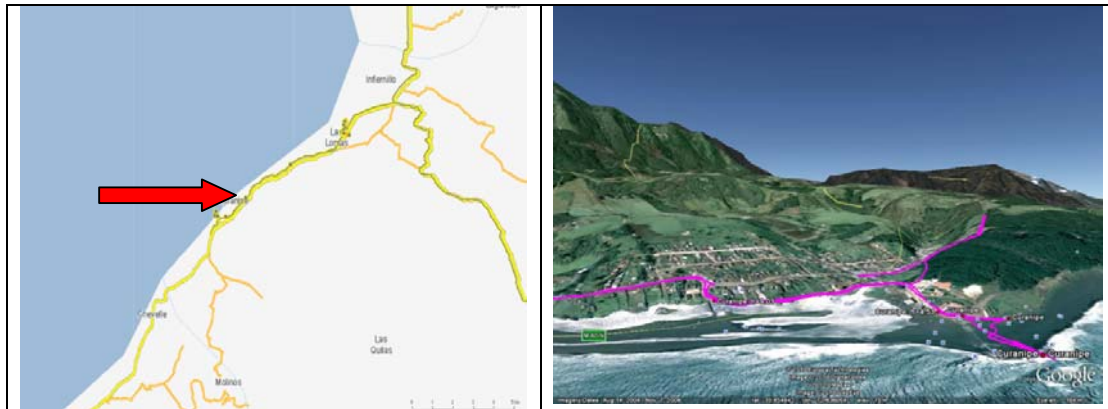
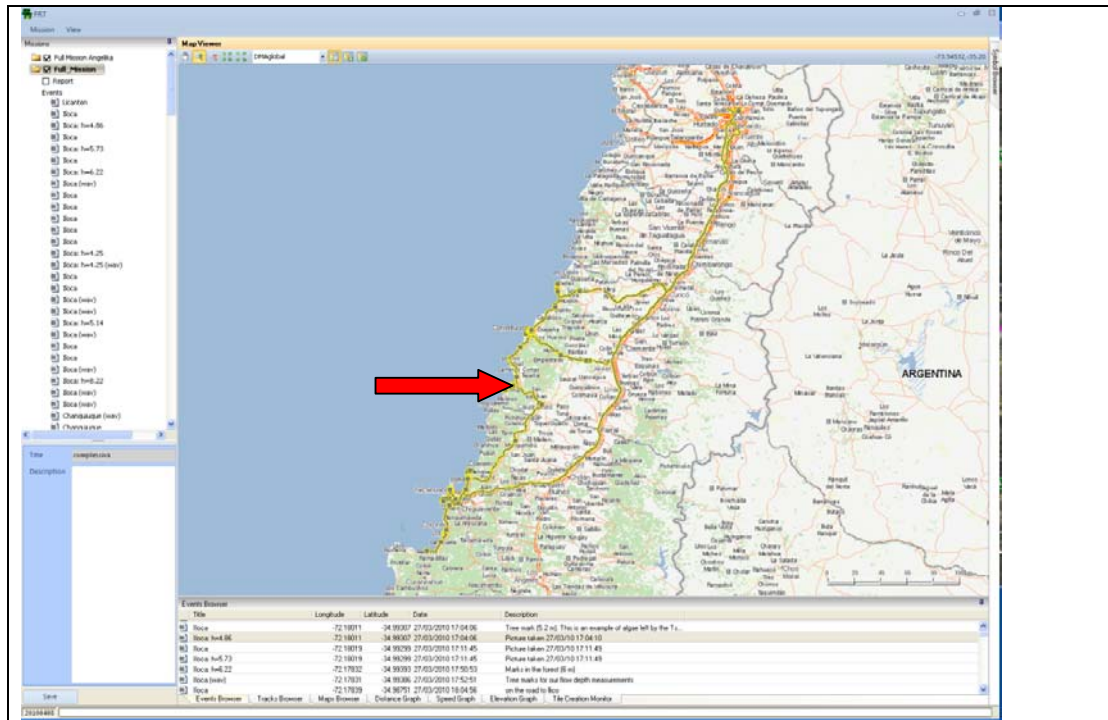
*Figure 25 – Measurements made on a rock at higher elevation than beach level*

ID	Date/Time	Longitude	Latitude	Tidal height	Meas. Height	Water Height	Type
103	28/03/2010 18:42	-72.5986	-35.82093	0.1	11	11.1	Run-up

*Table 6 - Measurements from Playa Lovelan*

### 3.7 Curanipe

Lon: -72.6341 Lat: -35.84386



Curanipe is a nice touristic town with a large oceanfront (see Figure 26). The majority of properties were at a higher elevation than the level reached by tsunami waves. Therefore, even if the runup measurement here was relatively high (see Figure 27), the overall destruction observed in Curanipe was significantly less than in Pelluhue where several houses were located at lower elevations. A bridge at Curanipe had collapsed (probably due to the earthquake) but military had constructed another one for temporary use. The measurements appear on Table 7.



*Figure 26 – Images of Curanipe. Top images: destruction on the beach. Middle images: houses near the main road. Bottom image: view of failed bridge.*





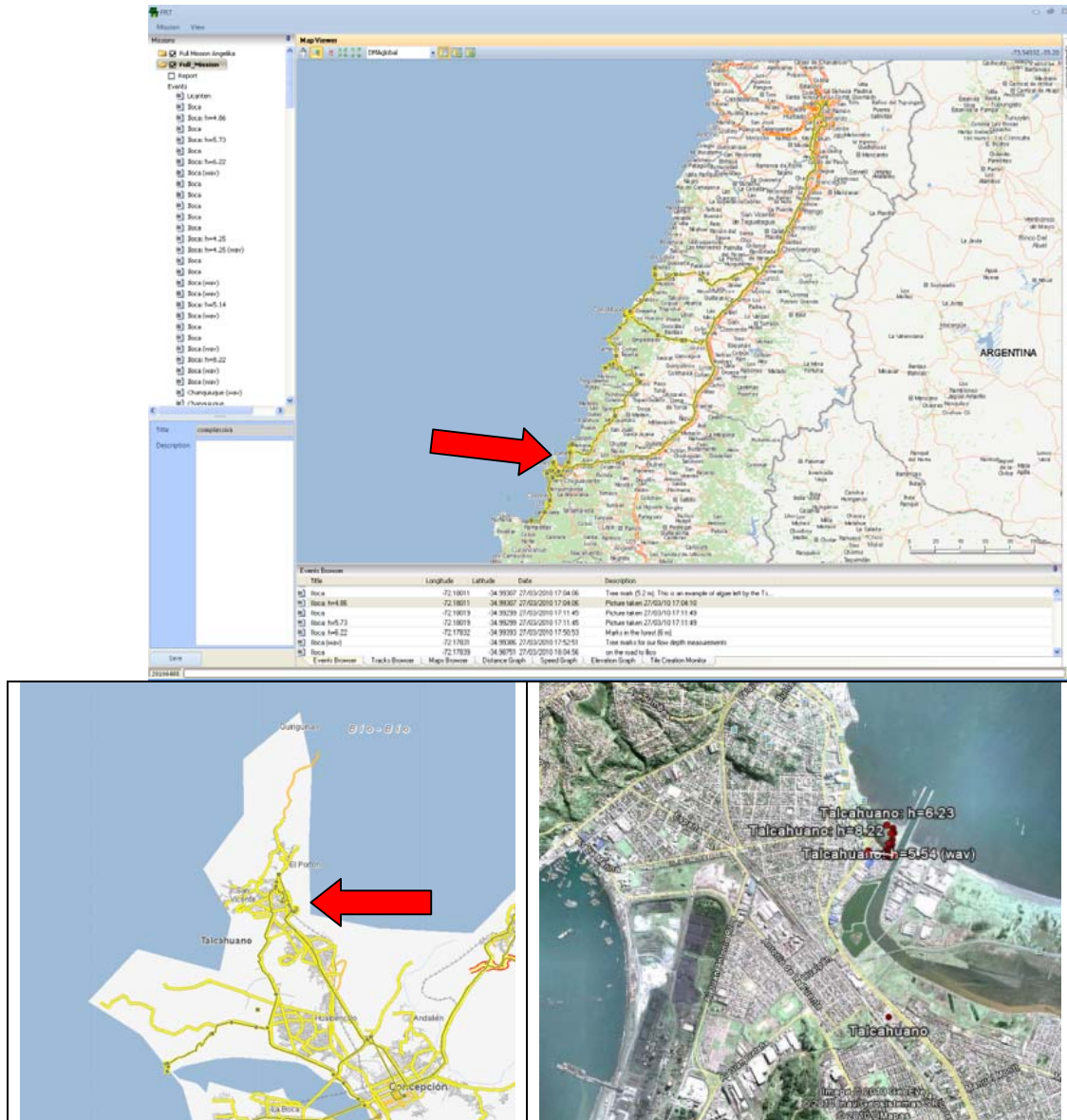
*Figure 27 – Point of highest runup measurement recorded in Curanipe*

ID	Date/Time	Longitude	Latitude	Tidal height	Meas. Height	Water Height	Type
110	28/03/2010 19:39	-72.6386	-35.84365	0.03	4.5	4.5	Inundation
111	28/03/2010 19:51	-72.6341	-35.84386	0.03	9.0	9.0	Run-up

*Table 7 - Measurements from Curanipe*

### 3.8 Talcahuano

-73.1052      -36.725363

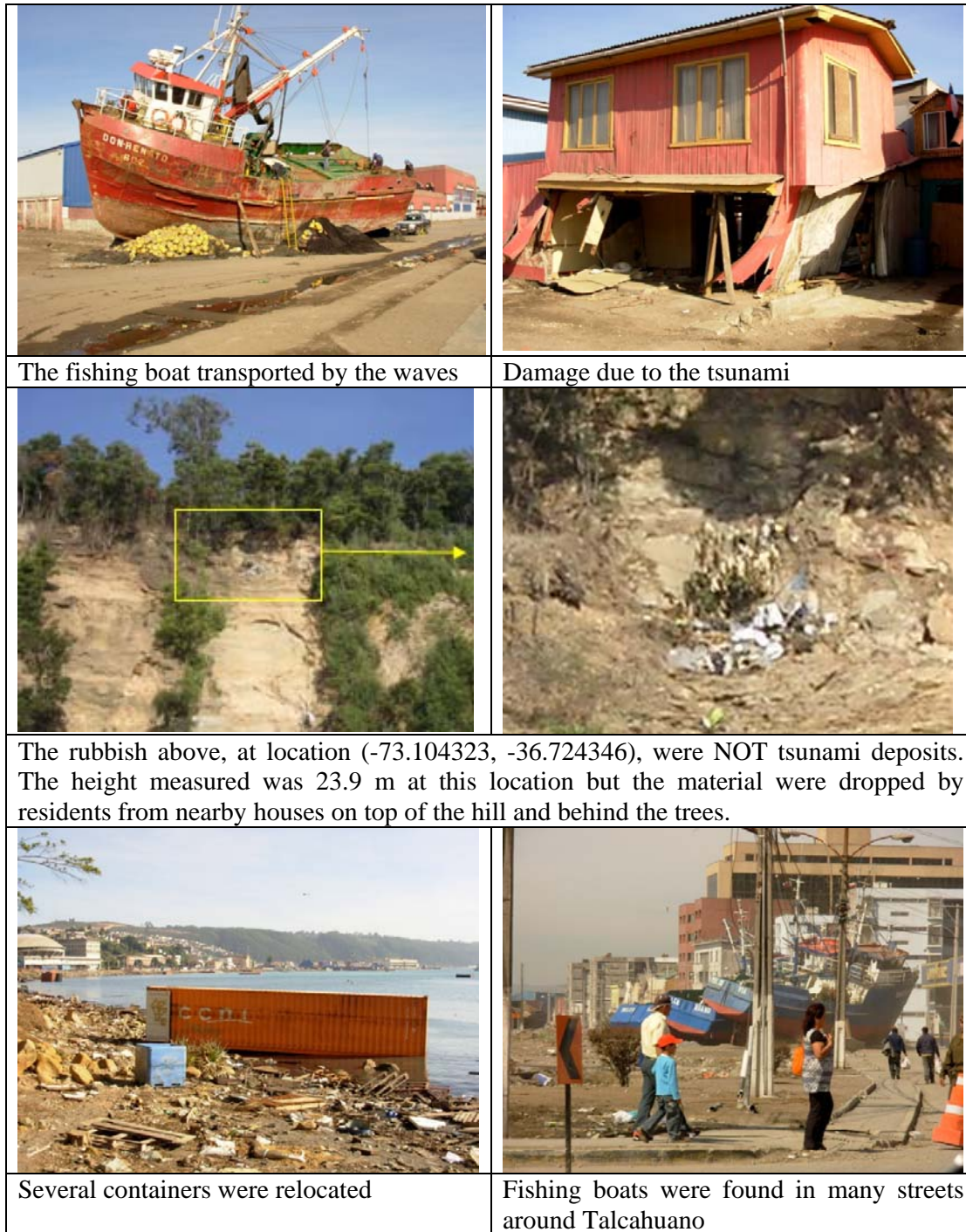


Talcahuano is a port town in central Chile with an economy largely based on the fishing industry and Chile's main naval base. In Talcahuano we surveyed the location El Morro (-73.104763, -36.725254) near a boat transported from the bay to a street, and placed about 80 m from the shore. This location is near one end of the gulf of Talcahuano, close to the entrance of an internal channel.

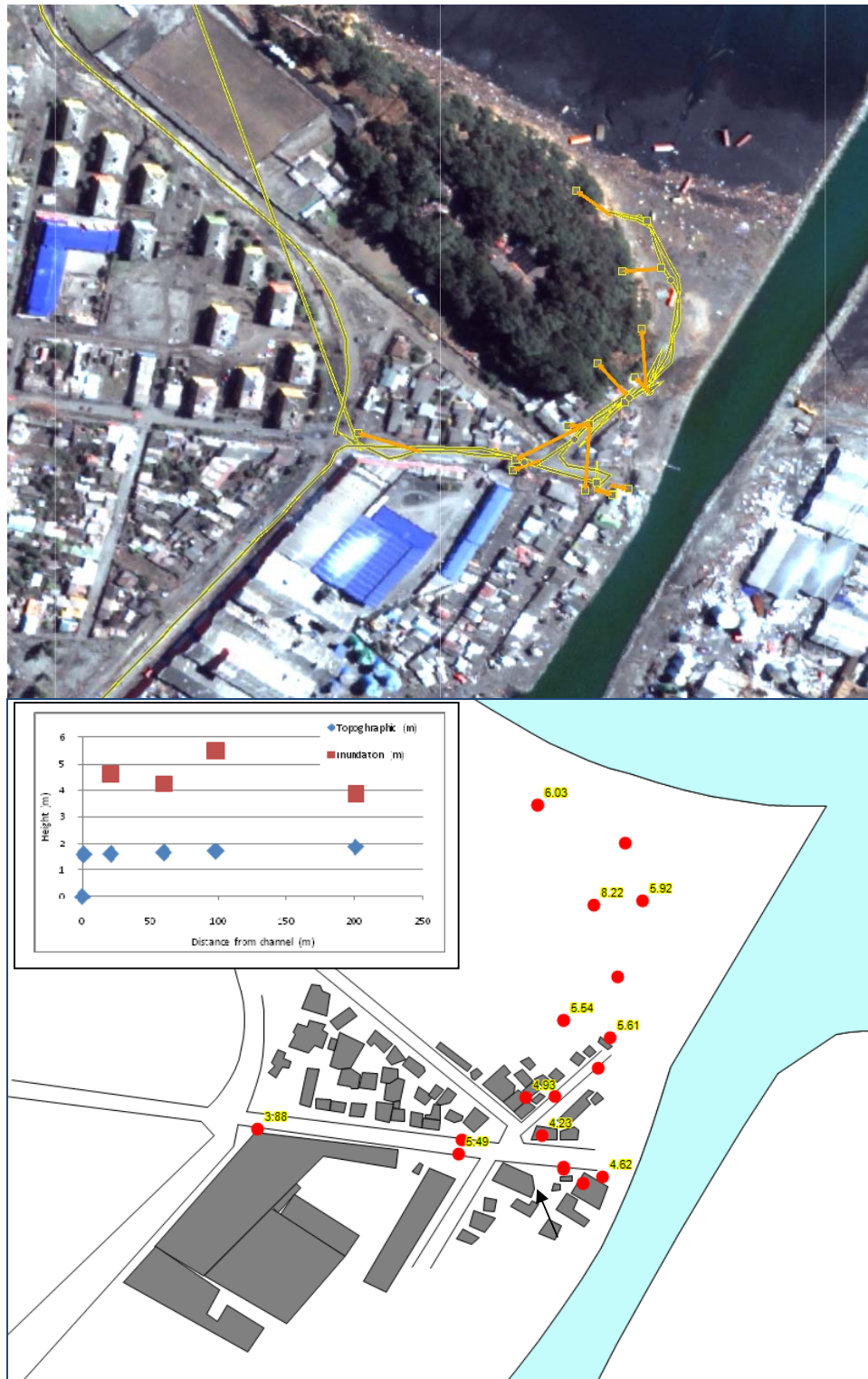
Several measurements were taken at nearby locations at the oceanfront and along 2 streets in order to identify the height of tsunami waves in the area. The fishing boat that was placed in the middle of the street, according to witnesses, can only float if the water depth is more than 1.5 m. At the location of the boat we measured 5.5 m as inundation height; since the street is about 4 m above the water the estimated water depth present at this location is about 1.5 m and is consistent with the minimum depth for the boat to float, as reported by eyewitnesses. One of the fishermen we interviewed (*Ernesto Neira*) mentioned that the boat was on the bay before the tsunami arrived and about 1 km away from the location where the boat was left (Figure 28).



Multiple measurements were carried out around this area in order to collect suitable inundation data. Measurements were taken on two different roads using the boat as the end point and then continuing further away from the bay on another street (Figure 29).



*Figure 28 - Images of Talcahuano*

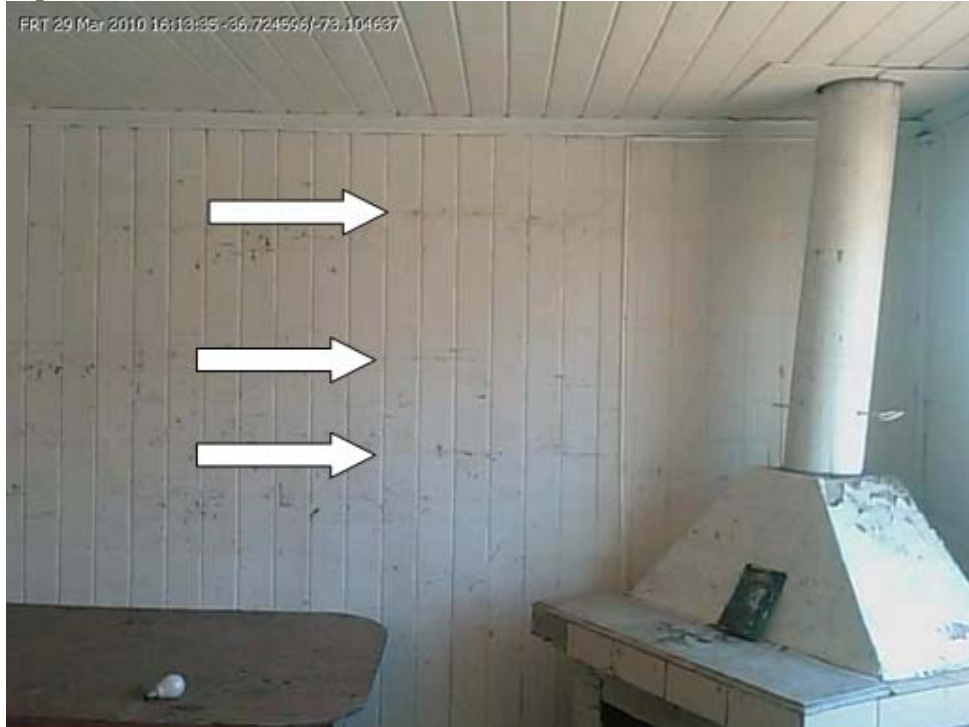


**Figure 29 - Inundation measurements**

Many houses near the port of Talcahuano show three distinct marks of water levels. Eyewitnesses insisted that these were evidence of the three waves they experienced. Since most people interviewed insist on the third wave being the largest wave, it seems difficult that a later and higher wave would

not delete the marks of a previous wave. We therefore believe that the lower marks are associated with the later arrivals of smaller waves.

In particular, clear marks depicting different wave levels were- as measured with respect to the house floor: 80 cm, 120 cm, 190cm (corresponding to 1st, 2nd and 3rd waves according to residents: *Yaresla Ramirez*, *Gerardo Ramirez* a fisherman, Figure 30). The floor of the house is at 1.8m above sea level. The different marks –evidence of distinct water levels were a common sight around this location- and open for interpretation. All the people from this area evacuated because they had to leave due to past experience.



***Figure 30 Eyewitnesses insisted on 3 waves leaving marks inside the house.***

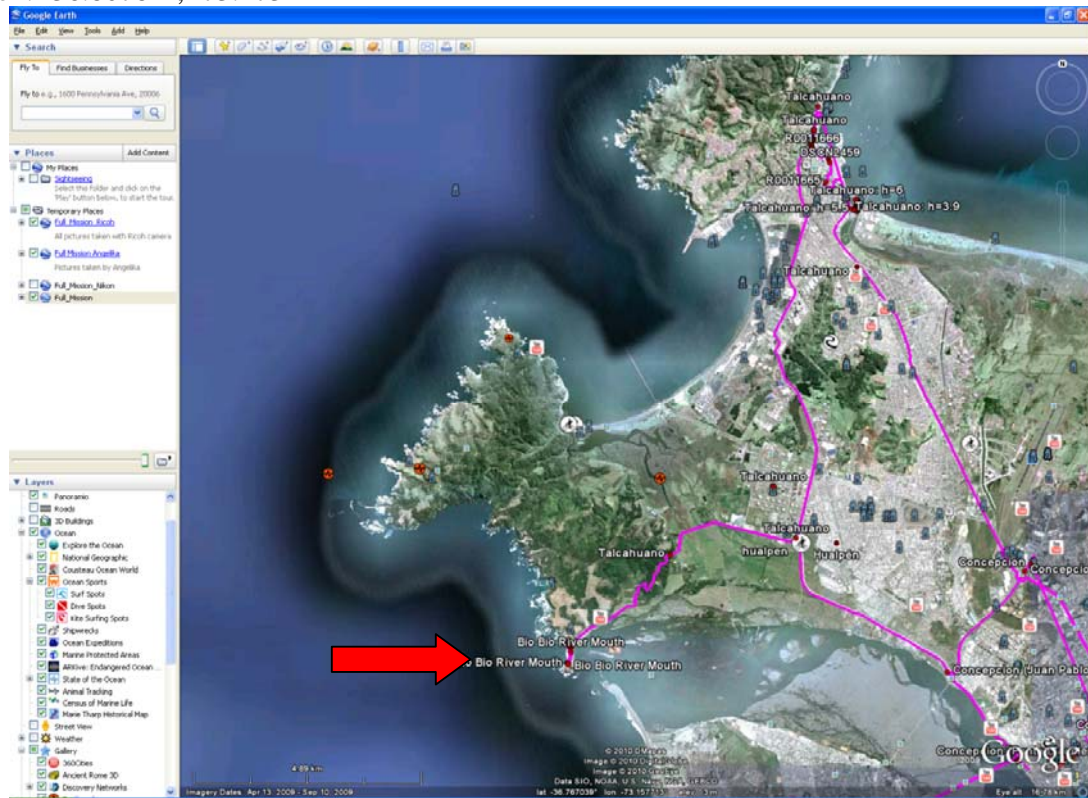
ID	Date/Time	Longitude	Latitude	Tidal height	Meas. Height	Water Height	Type
117	29/03/2010 13:26	-73.1052	-36.725363	1.59	3.9	5.49	Run-up
118	29/03/2010 13:36	-73.1044	-36.724697	1.61	4	5.61	Run-up
120	29/03/2010 13:48	-73.1045	-36.723935	1.62	6.6	8.22	Run-up
121	29/03/2010 13:49	-73.1042	-36.72391	1.62	4.3	5.92	Run-up
122	29/03/2010 13:56	-73.1048	-36.723362	1.63	4.4	6.03	Run-up
123	29/03/2010 13:56	-73.1048	-36.723362	1.63	4.6	6.23	Run-up
126	29/03/2010 14:13	-73.1046	-36.724596	1.64	3.9	5.54	Run-up
127	29/03/2010 14:13	-73.1046	-36.724596	1.64	3.9	5.54	Run-up
129	29/03/2010 14:25	-73.1049	-36.725041	1.63	3.3	4.93	Run-up
130	29/03/2010 14:28	-73.1047	-36.725507	1.63	2.6	4.23	Run-up
132	29/03/2010 14:37	-73.1044	-36.725491	1.62	3	4.62	Run-up
133	29/03/2010 14:40	-73.1045	-36.725531	1.62	1.8	3.42	Run-up
134	29/03/2010 14:42	-73.1045	-36.725534	1.61	1.4	3.01	Run-up
137	29/03/2010 14:58	-73.1064	-36.725092	1.58	2.3	3.88	Run-up

*Table 8 – Measurements from Talcahuano*



### 3.9 Boca (estuary) Bio Bio, Talcahuano

Lat/Lon:  $-36.80784^{\circ}$ ,  $-73.1734^{\circ}$



North of the Bio Bio estuary there is a natural park, Pedro del Rio Zanartu Park, where the tsunami did not produce devastation as in other parts in the region. Most of the changes observed in the topography were caused by the earthquake. For example, an uplift of 1-2 m can be seen in the rocks and in the beach area that is now larger due to the uplift. We interviewed the park director that has been monitoring the changes in the park, post-earthquake and pointed the uplift and tsunami marks (see Figure 31).

We measured 5.4 m and 6.1 m run-up in two places close to the shore (see Figure 32). A summary of the measurements appears in Table 9.





**Figure 31- Changes in the near shore topography. Images from Google Panoramio (top-left) and camera (top-right). Prior to tsunami it was impossible to reach the rock without walking on the water (based on the interview of the director of the natural park shown here on the lower left).**



*Figure 32 – Measurements from BioBio estuary . Note the GPS track which is on the water*

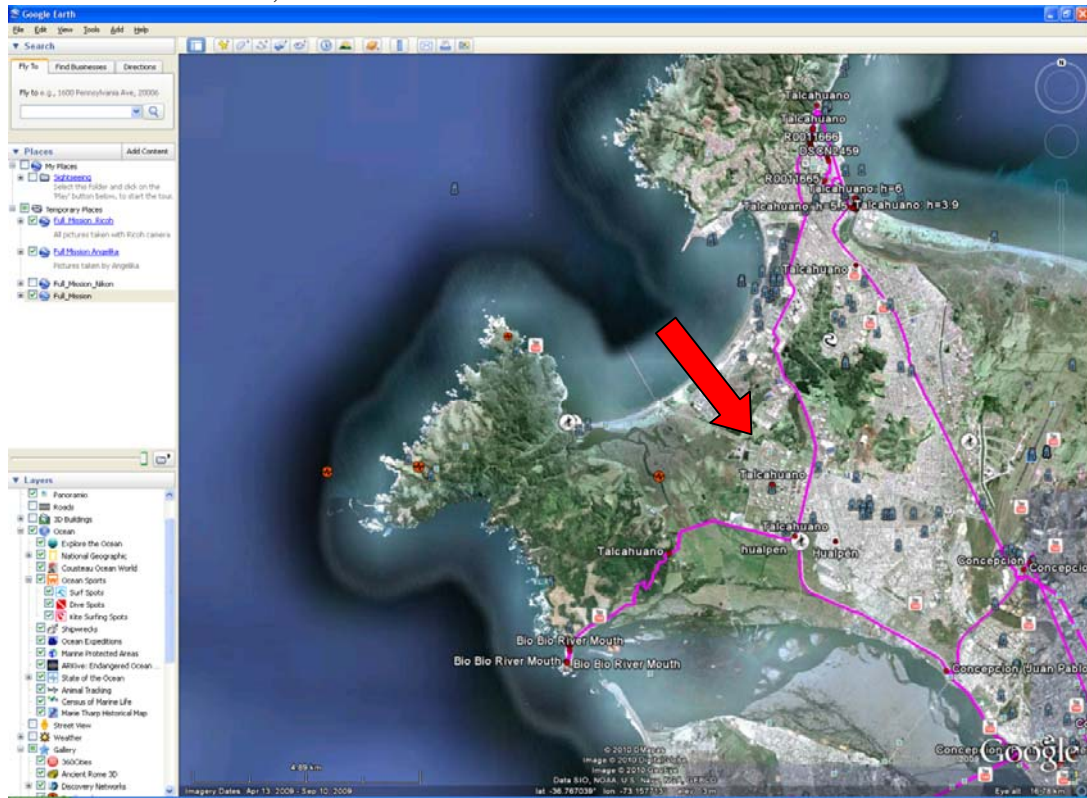
ID	Date/Time	Longitude	Latitude	Tidal Height	Meas. Height	Water Height	Type
148	29 Mar 2010 18:05:38	-73.17336	-36.80876	0.6	4.8	5.4	R
155	29 Mar 2010 18:46:48	-73.173766	-36.812224	0.6	5.5	6.1	R

*Table 9 – Measurements from the Northside of the BIO BIO estuary*



### 3.10 ENAP Refinery, Talcahuano

Lat/Lon: -36.778514°, -73.124967°



ENAP refinery is situated in Talcahuano at about 2km from the sea. Limited damage and cracks due to the earthquake were noted in the fence delimiting the refinery, in a street lamp and in a shed (see Figure 31). Due to lack of time and obvious difficulties on obtaining a permit to enter the facilities, we cannot conclude much more on the overall damage caused by the earthquake on the industrial equipment.

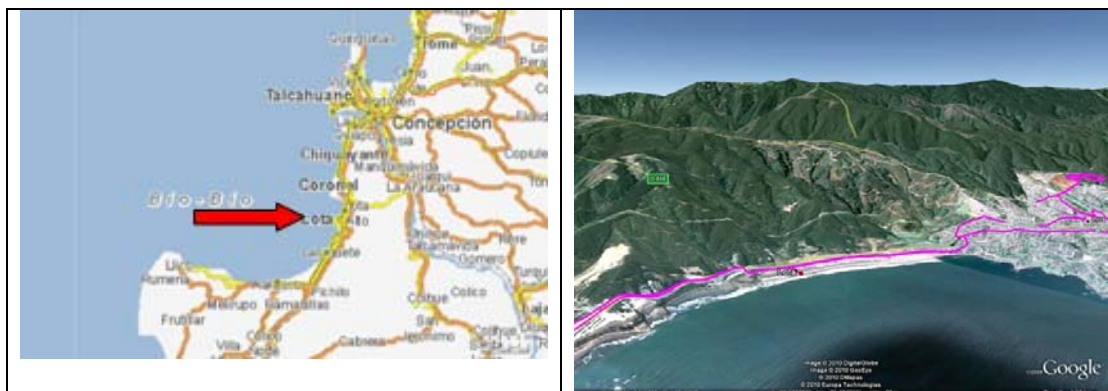
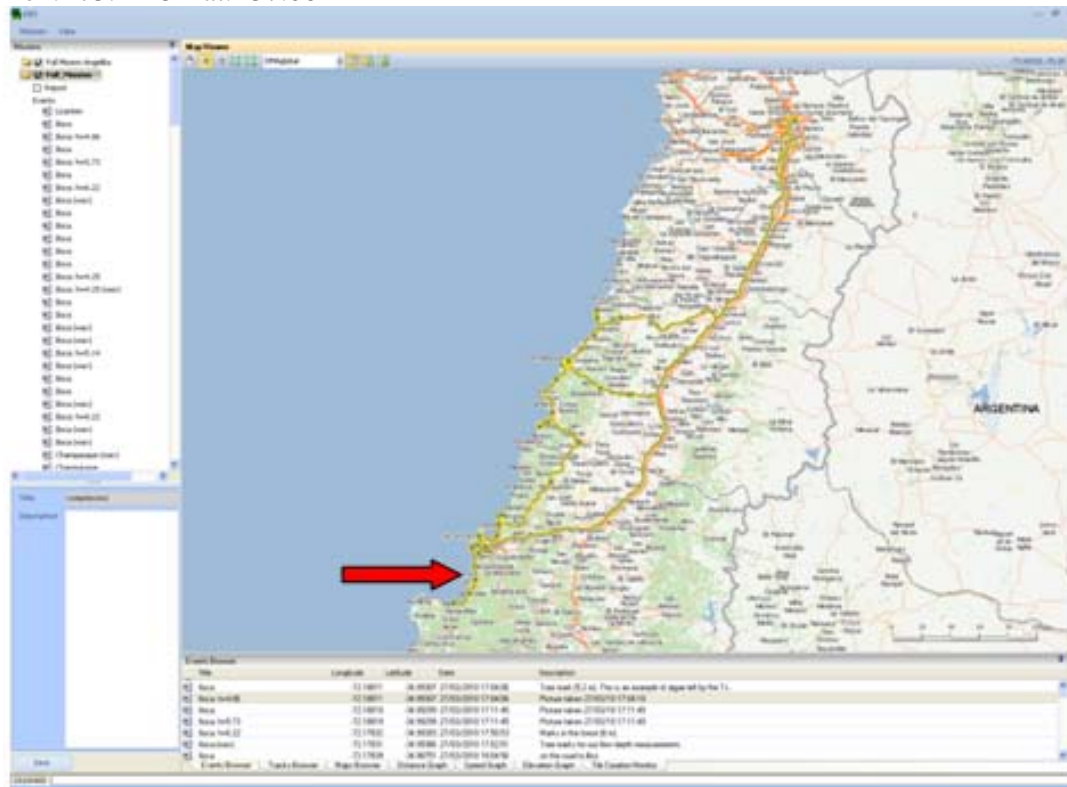


*Figure 33- Visible damages to ENAP refinery.*



### 3.11 Lota and Laraquete

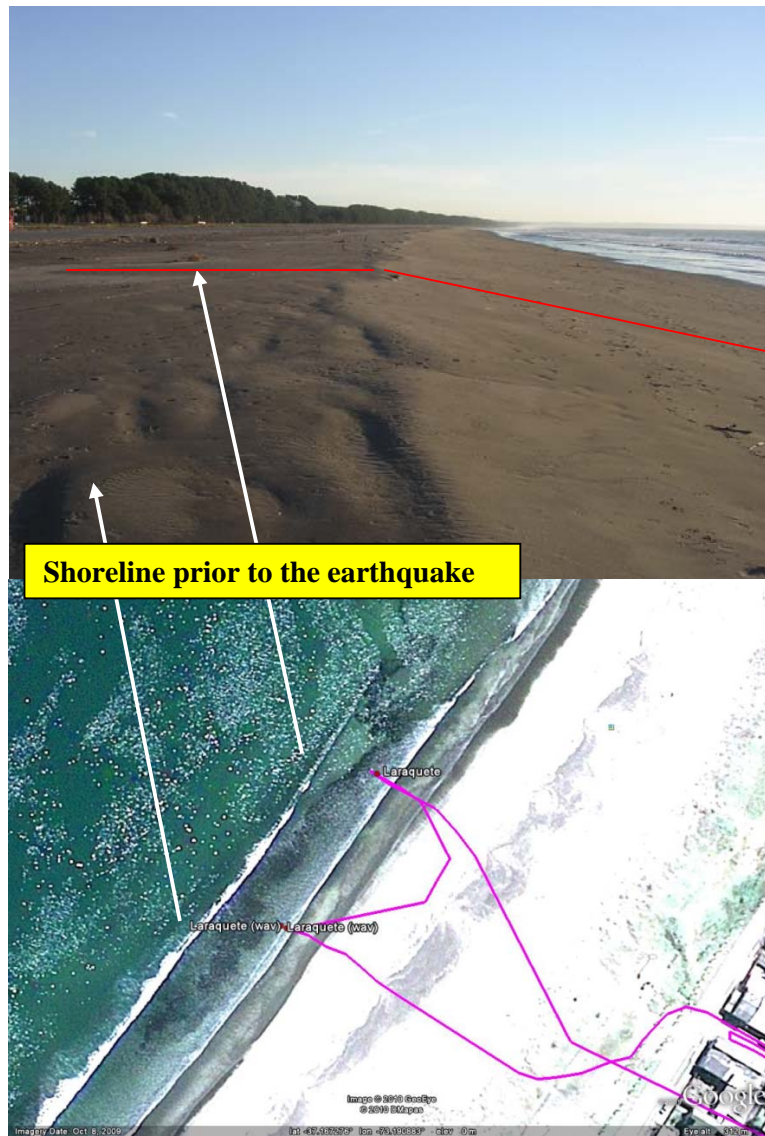
Lon: -73.1425 Lat: -37.0614



In the sand beaches around Lota we could still find signs of tsunami inundation. According to people interviewed, the beach has enlarged – due to uplift. It was possible to confirm this by the change in the profile of the beach which shows the original sea position (Figure 34).



*Figure 34 - In the image above we indicated the post-earthquake profile of the beach with a flat section (corresponding to the dark sand delineating the original seal level position).*



*Figure 35 - Laraquete beach*

The image above (Figure 34) was taken south of Lota, in Laraquete. Also here the sand beach appears larger than before. The position of the image above, identified in Google Earth shows clearly that the point was previously below in the water which is not the case anymore

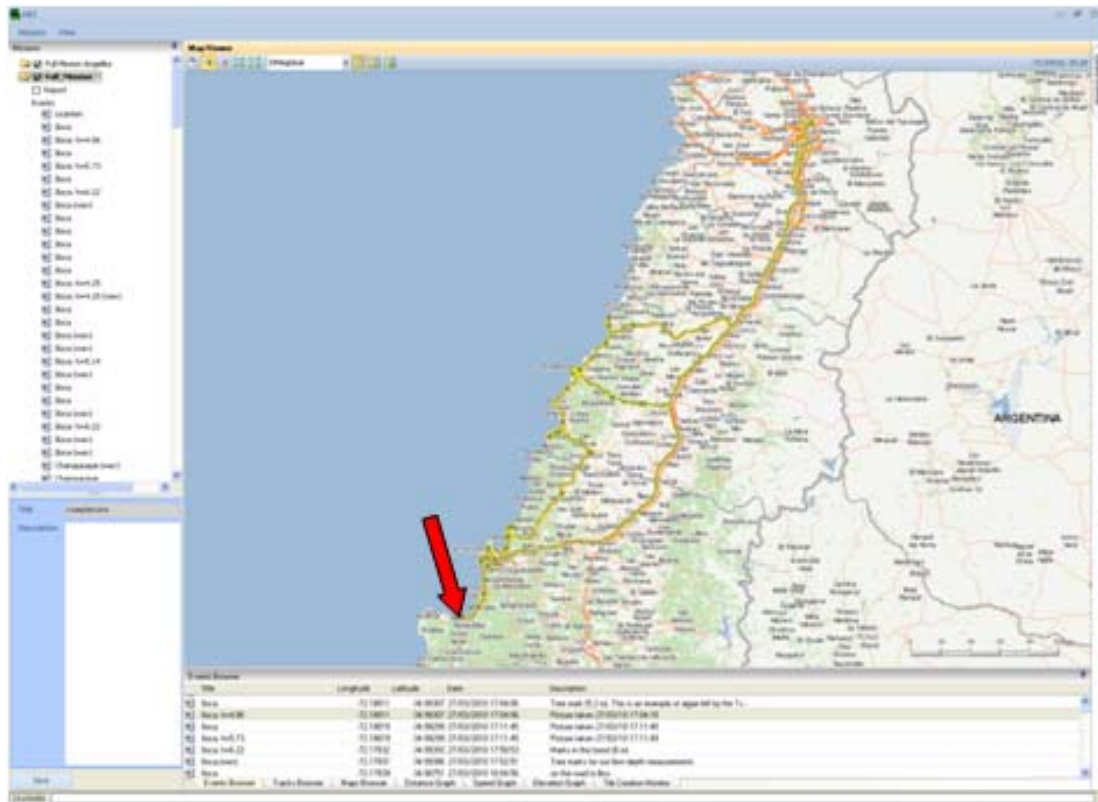
ID	Date/Time	Longitude	Latitude	Tidal height	Meas. Height	Water Height	Type
163	29/03/2010 20:45	-73.1425	-37.0614	0.3	3.3	3.6	Run-up

*Table 10 - Measurements from Lota and Laraquete*



### 3.12 Arauco

Lon: -73.315 Lat: -37.24145



The measurements in Arauco were taken about 700 m from the shore because the beachfront was not easily accessible. At one of the locations we measured 3.2 m water depth with respect to the still water. In a channel navigated in the past by small boats the water depth was less than 10 cm, thus uplift higher than 1 m was estimated.





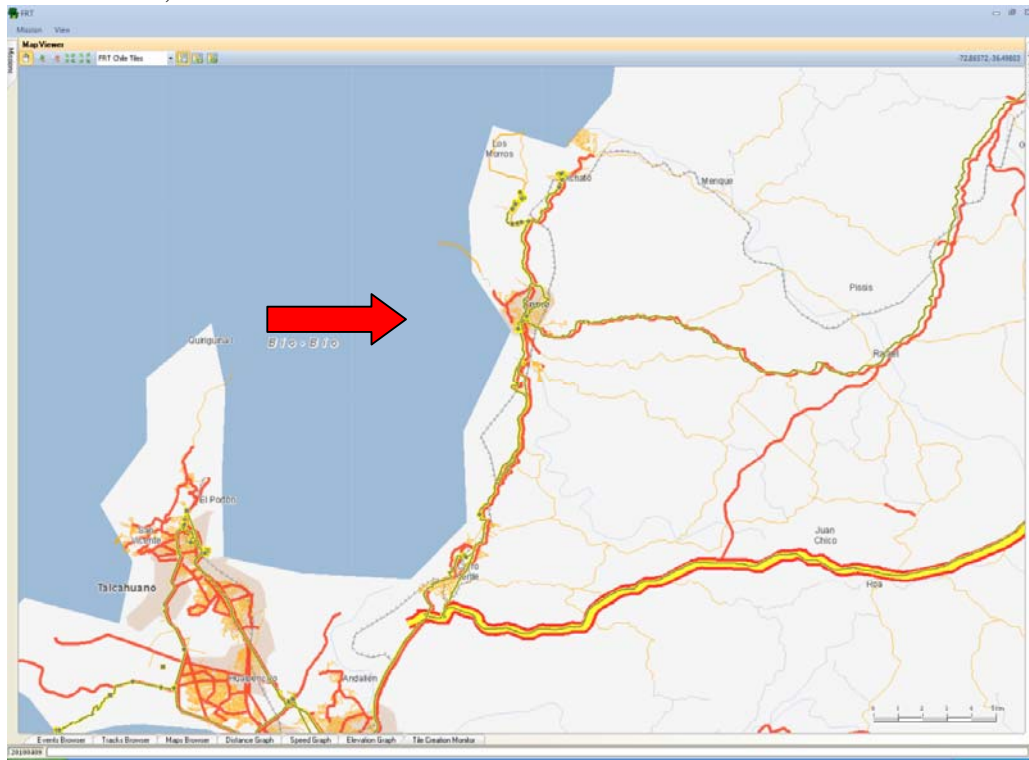
*Figure 36 - Measurements from Arauco*

ID	Date/Time	Longitude	Latitude	Tidal height	Meas. Height	Water Height	Type
170	29/03/2010 23:04	-73.315	-37.24145	0.9	2.3	3.2	Run-up

*Table 11 – Measurements from Arauco*

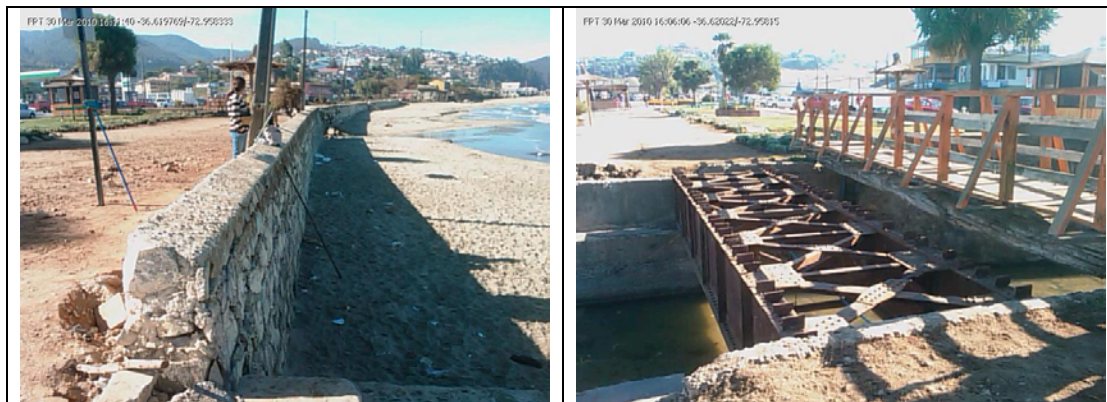
### 3.13 Tomé

Lat/Lon: -36.610920°, -72.957024°



In Tomé the water managed to cross the road parallel to the beach but barely reached the businesses and houses on the other side (see Figure 31). Only partial damage to a bridge was observed. The measured water height here was 4.6m.

The measurement taken in this location appears in Table 12.



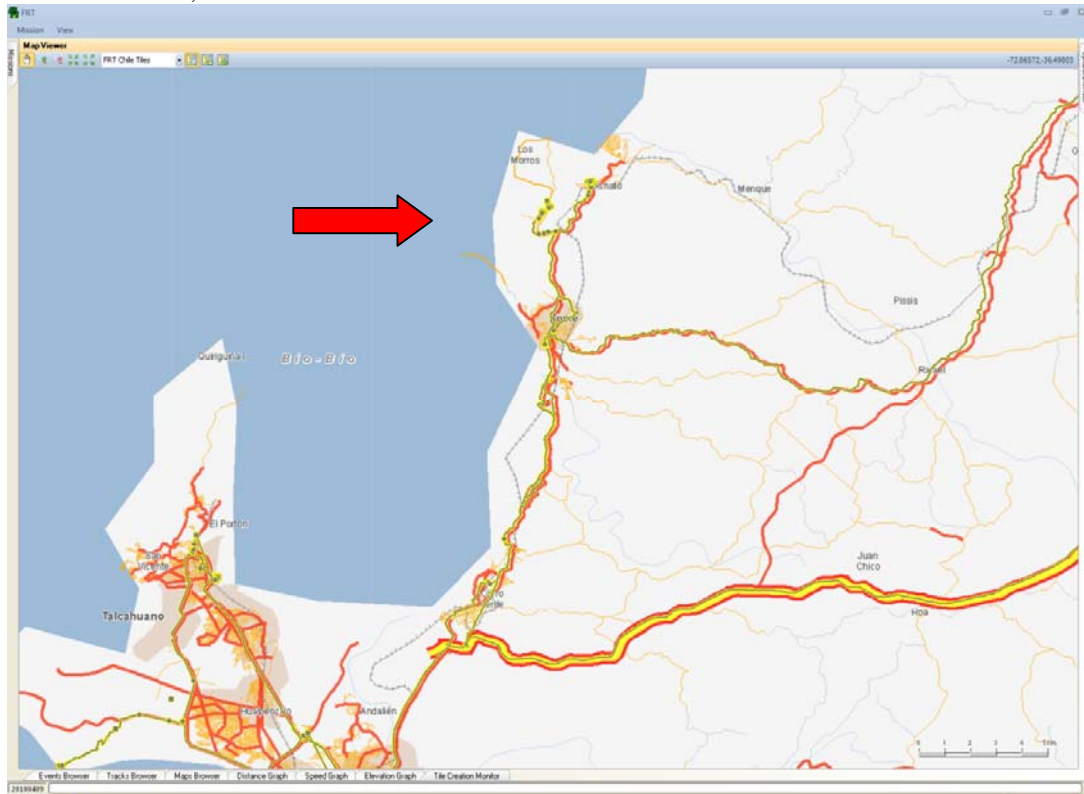
*Figure 37- Side view of the beach and partially damaged bridge in Tomé*

ID	Date/Time	Longitude	Latitude	Tidal Height	Meas. Height	Water Height	Type
177	30 Mar 2010 14:11:40	-72.958333	-36.619769	1.7	2.9	4.6	R

*Table 12 - Measurements from Tomé.*

### 3.14 Coliumo

Lat/Lon: -36.558605°, -72.957253°



In Coliumo bay, close to Dichato, the maximum run-up value measured was 9.8m (at 500 m from the shore). The inundation height at 60m from the shore was 9.2m, while at 300m was 10.6m. Three fishing boats (visible from satellite imagery) were transported by the tsunami waves at least 1600m inland (see Figure 23). The inundation extent appears to be further inland and beyond the location of the bridge connecting Tomé with Dichato.

The shoreline has receded due to erosion by the waves (see Figure 39). The electrical lines and houses on the river bank were completely destroyed (area shown in picture is after the military removed all the debris, Figure 39 and Figure 40). The electrical line has been replaced by a new one. As in the other surveyed communities the military was fully involved in the cleaning operations (see Figure 40).

The water level of the river in Coliumo valley appeared lower by at least 50cm (picture shown was taken at high tide, see Figure 41). Cracks on the ground were visible at 4-5 m distance from the river bed, defining the interface between the moist (green grass) and the dry soil. It seems that the river bed and the moist soil uplifted less than the rest of the valley. Cracks on the ground caused by the earthquake were less visible due to erosion by the tsunami waves, showing different layers of sediments.

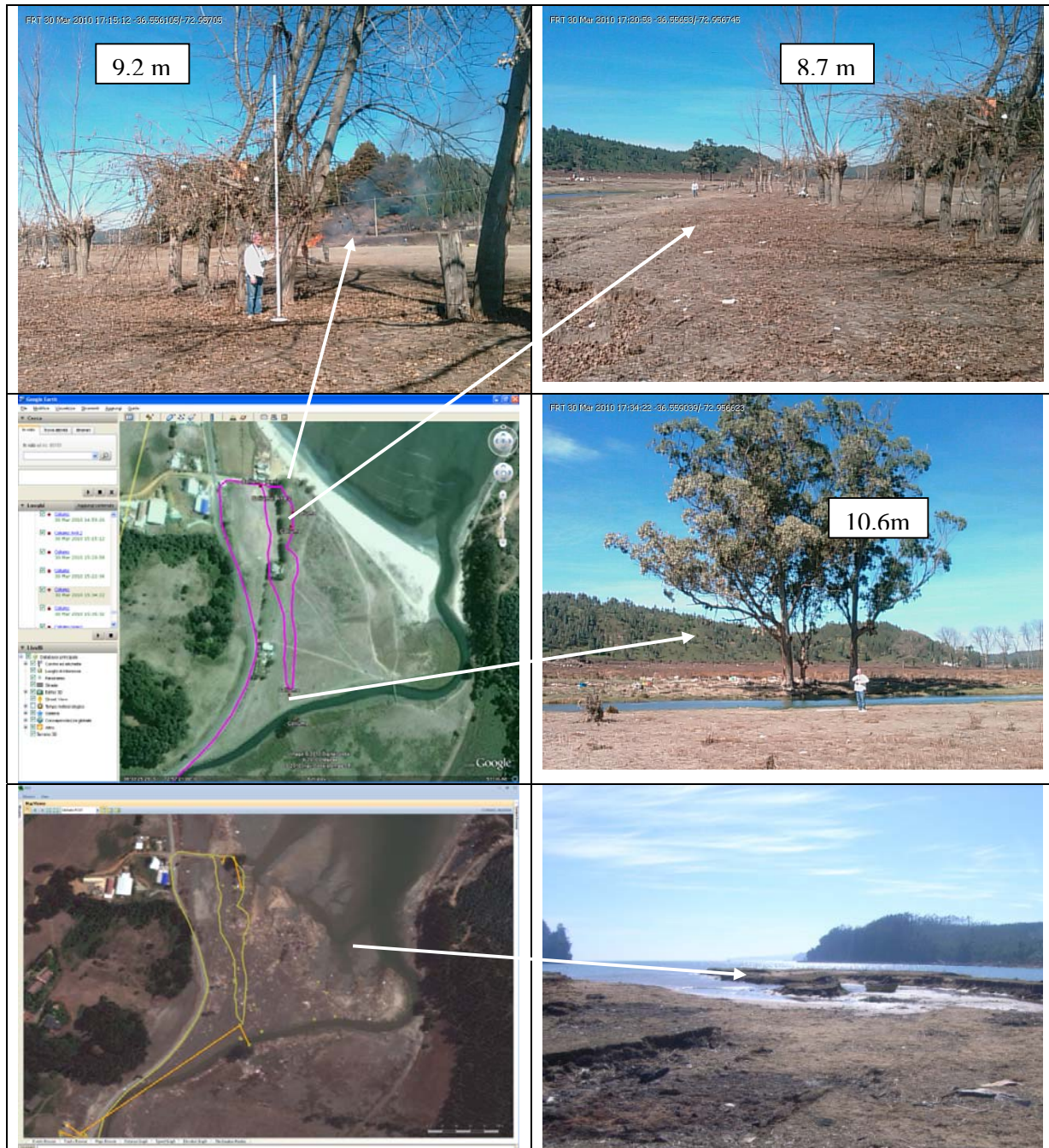
Based on an interview of a local resident (employee of Dichato municipality and a traffic inspector) the third wave was the largest, arriving about 3 hours after the earthquake. The water was first receding, emptying the bay, and finally entering like a wall. The abnormal wave activity finished in late afternoon.





**Figure 38 – Coliumo bay – Three fishing boats transported by the tsunami waves. The kill boat was at 8.6 m elevation. The waterline of the vessels corresponds to the run-up line. The measurements were taken with respect to the water river level, which seems close to the sea level.**





*Figure 39 - Inundation and shoreline erosion*

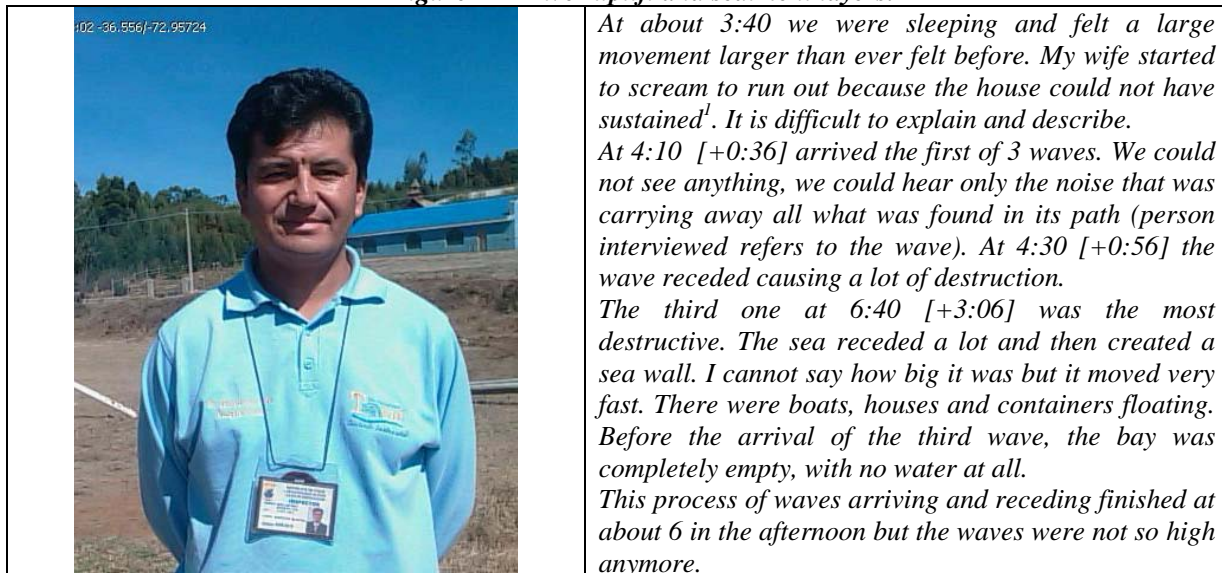


*Figure 40 - Two rests of the destroyed houses and the electrical line. Soldiers at work.*





**Figure 41 - River uplift and sediment layers.**



**Figure 42 - Interview to local inhabitant.**

<sup>1</sup> It means that they run out because were scared that the house could not survive the strong shaking from the earthquake.

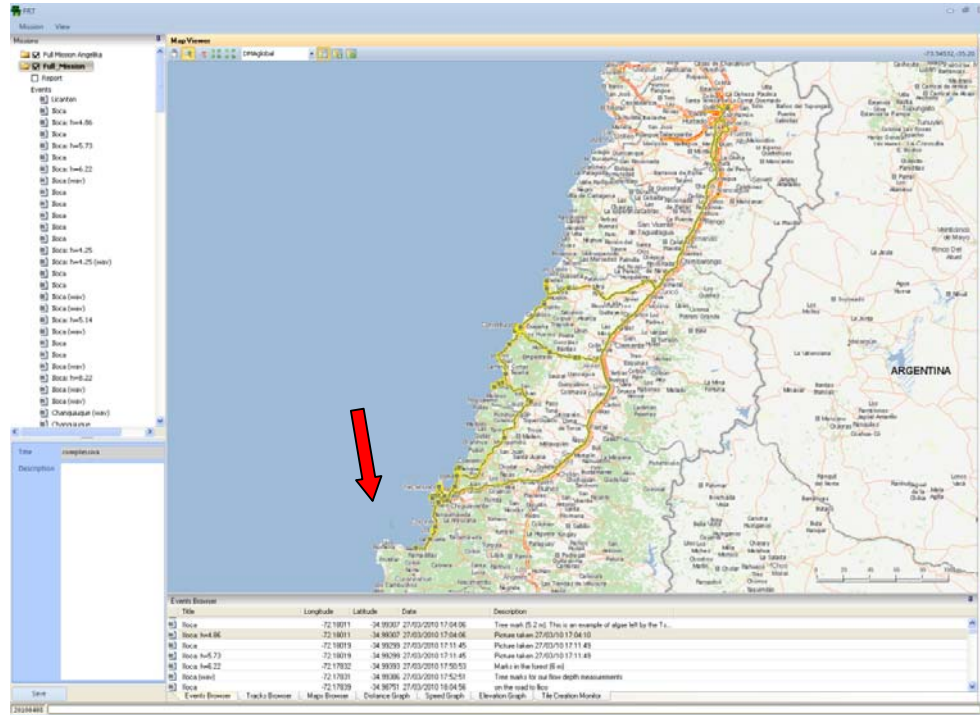
ID	Date/Time	Longitude	Latitude	Tidal Height	Meas. Height	Water Height	Type
181	30 Mar 2010 14:49:19	-72.959565	-36.560301	1.7	6.9	8.6	R
182	30 Mar 2010 14:53:25	-72.959665	-36.560438	1.7	7.8	9.5	R
183	30 Mar 2010 14:55:23	-72.95916	-36.56062	1.7	8.1	9.8	R
185	30 Mar 2010 15:15:12	-72.95705	-36.556105	1.7	7.5	9.2	I
186	30 Mar 2010 15:20:58	-72.956745	-36.55653	1.7	7.0	8.7	I
188	30 Mar 2010 15:34:22	-72.956623	-36.559039	1.7	8.9	10.6	I
189	30 Mar 2010 15:35:32	-72.95677	-36.55872	1.7	8.2	9.9	R

*Table 13 - Measurements from Coliumo.*



### 3.15 Dichato

Lon: -72.937 Lat: -36.54675



Dichato is located within a north oriented bay 1.8 km wide and 2.6 km long oriented. The houses below a certain elevation were completely destroyed by the tsunami (Figure 43).

Local resident Julia Cacerez interviewed in Dichato told us this was the first time to experience a tsunami. She run after the shaking. She estimated the arrival of the first wave at 4am. Construction workers told us that construction would not be allowed in the inundated area, i.e., 100 m from the beach.

In Figure 44 the tsunami marks are clearly identified in the interior and the exterior of a house, on the 1<sup>st</sup> floor; Figure 45 provides a view of the water profile on a street perpendicular to the beach.



*Figure 43 - Images of Dichato*





**Figure 44 - The interior of the building above that housed a restaurant shows very clearly the water level. Relating this elevation (red arrow) to the outside of the structure, it coincides with a difference of 10-15 cm with the damage of the house (blue arrow).**



**Figure 45 - Satellite image of Dichato**

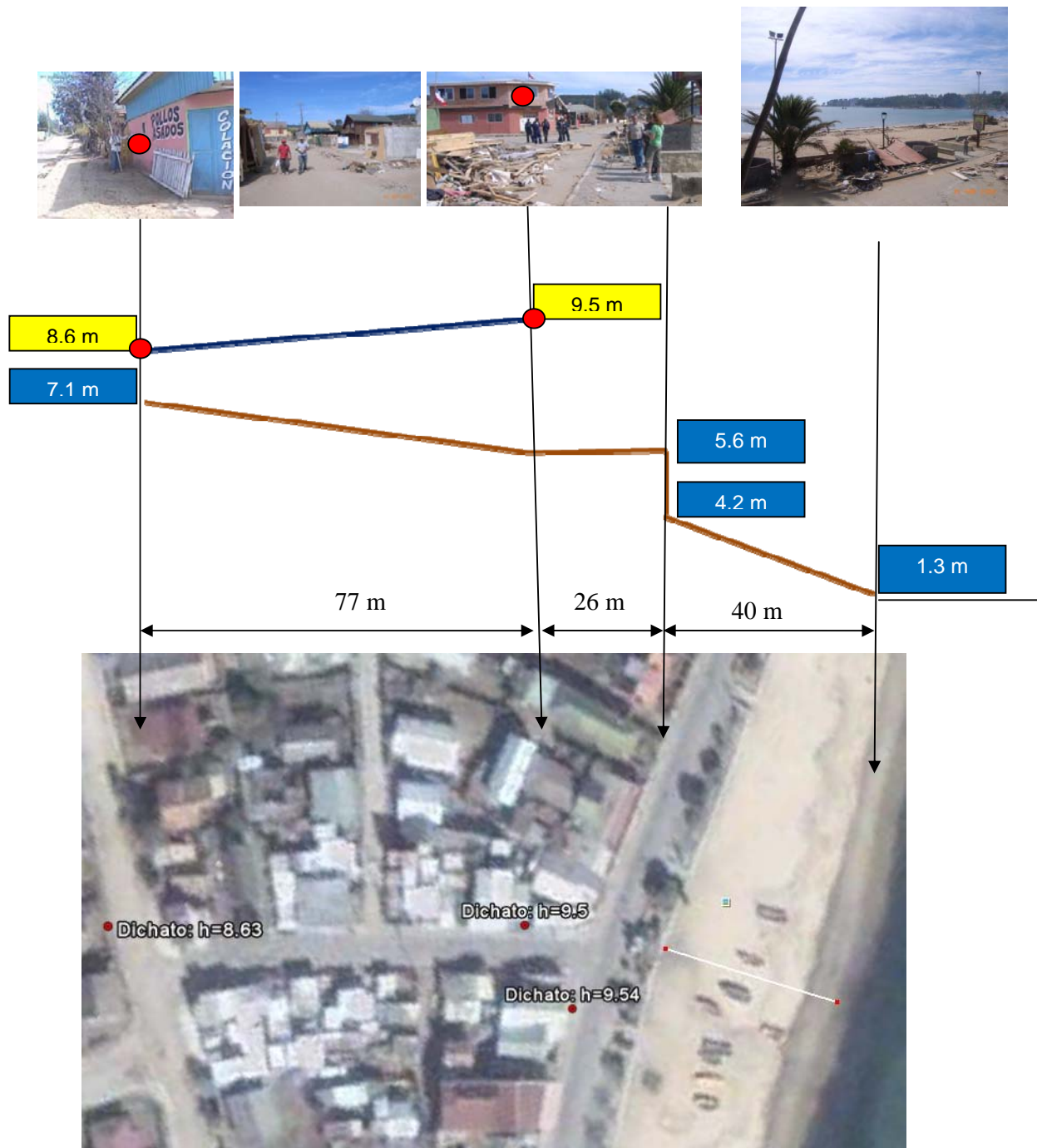


Figure 46 - Water profile in Dichato



ID	Date/Time	Longitude	Latitude	Tidal height	Meas. Height	Water Height	Type
194	30/03/2010 15:55	-72.937	-36.54675	1.34	8.2	9.54	Inundation
195	30/03/2010 16:55	-72.9387	-36.54763	1.25	5.5	6.75	Inundation
196	30/03/2010 16:57	-72.9365	-36.54747	1.33	7.3	8.63	Run-up
197	30/03/2010 17:00	-72.9371	-36.54691	1.3	8.2	9.5	Inundation
198	30/03/2010 17:01	-72.9384	-36.547455	1.27	3.6	4.87	Inundation
199	30/03/2010 17:15	-72.9385	-36.54744	1.24	4.5	5.74	Inundation
200	30/03/2010 17:21	-72.938	-36.547909	1.22	4.6	5.82	Inundation

*Table 14 - Measurements from Dichato*

#### 4 Evaluation of wave arrival time based on interviews

Many eyewitnesses i.e. fishermen are very knowledgeable about waves but may define differently what a wave is. Therefore a coherent evaluation of the tsunami waves arrival time through eyewitness accounts is not a trivial task for various reasons:

- How one perceives time is not straightforward. When in a hurry and in dramatic conditions estimates of time and duration of events may not be as accurate as under normal conditions. In this we need to also consider the fact that the earthquake happened during the night, when most people were sleeping.
- The individual waves, which are part of the same train of waves, could be indicated as multiple waves suggesting incorrect information on the number of waves arrived.
- The time difference between events (i.e. between arrival of waves) or the absolute time of an event is also another point of possible misunderstanding.

In order to identify the real tsunami waves we proposed during the interviews the term “marejada” (storm surge) instead of “ola” (wave) which seemed to produce a better response to our questions. The complete collection of answers and the corresponding locations where they were performed are indicated in the table below.

Most people remembered several waves. There was a concordance between the interviews in the arrival time of the first wave, although we had interviews at different locations where the first wave arrived at slightly different times. Extract from the interviews, arrival times of the three major waves are listed in local time in the table below. A common understanding between the eyewitnesses was that the tsunami event lasted several hours (e.g. 12 h) after the earthquake event.

			First Wave		Second wave		Third wave	
	Long	Latit	Arrival	Receding	Arrival	Receding	Arrival	Receding
Lloca	-72.1842	-34.9682	3:39		3:54		4:04	
Lloca	-72.1794	-34.9262	3:54		3:59		4:04	
Talcahuano	-73.1046	-36.7246	5:20		5:35		5:45	
Talcahuano	-73.1046	-36.7255	5:00					
Coliumo	-72.9572	-36.556	4:10	4:30			6:40	
Dichato	-72.9387	-36.5476	4:00					

## 5 Introduction to FRT and feedback

Most of the measurements were performed using the Field Reporting Tool software (FRT), developed by JRC in collaboration with the UN Cartographic Section as a means to report data efficiently back to JRC headquarters. FRT is also used by the JRC staff during Post Damage Need Assessment (PDNA) missions organized by JRC in collaboration with the UN and World Bank. Recently FRT was used following the Haiti earthquake.

The FRT application was conceived as follows:

- FRT *DeskTop* Application
  - To prepare maps for the PDA
  - To communicate with the server to get new maps or upload draft situation status
  - To fuse various missions collected with the PDA
- FRT *PDA* Application
  - To collect field data
  - To communicate with the server to get new maps or upload draft situation status
  - To communicate with the Notebook Application
- FRT *Server* Application
  - To collect data and automatically prepare the web pages to visualize the data

During the field data campaign we collected tracks and events with the *PDA* application. Each event was characterized by an image, metadata - that can be added while in the field or edited during post processing using the *Desktop* component - and a vocal comment (ex. Interviews). All events were uploaded on the server via GSM communication directly from the field. During the data collection we used several background layers to follow the mission; in particular we used:

- Open Street map for the streets network. This was very useful during our trip as we did not have another navigation system
- Post Event Satellite images of Constitución and Concepcion
- Calculated heights in watch points by codes used by JRC for tsunami simulations

This system is very efficient allowing the JRC staff in Ispra, Italy, to develop the overall collection maps and upload them in the UNESCO web site by the end of the collection campaign.

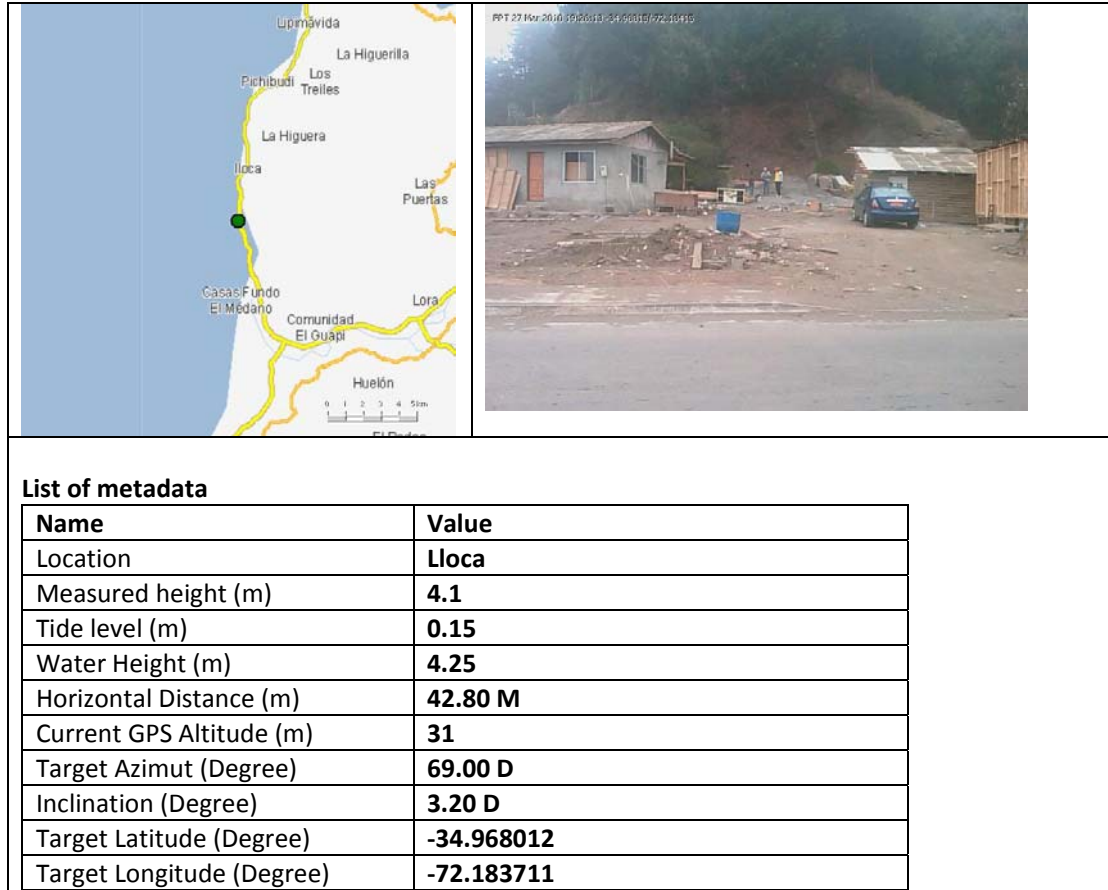
Since FRT can connect via Bluetooth with the Trimble device (we used to measure distances and heights) all these data were recorded simultaneously with the events data.

An example of data collection follows next. All measured data that were present in the events metadata and the list of all events that were produced with the Notebook component are included in the annex.



**Figure 47- Collecting the current location and the target location obtained by the Trimble gave us the ability to show (orange arrows) the original position of the image camera and the real point measured.**





*Figure 48 - Example of metadata attachment to events*

FRT proved to be very useful for the navigation and for the data collection because it allowed us store all the geolocation data and, without a major effort, the position of the image and of the target of the image (see Figure 47). In addition it enabled the transfer of all data directly from the field to the server. The JRC staff in Ispra, Italy could perform the processing of the data during the mission.

Another advantage of the system was the ability to use the tracks and the events to synchronize and geolocalize the images that did not have the location metadata. A minor issue associated with that was the recorded time that was different from UTC, in some cases. We have corrected this information during post processing and will correct the software accordingly.

For this particular mission, contrary to PDNA missions that requires finding specific houses on the ground as seen from satellite images, the small dimensions of the screen of the PDA did not prevent us from collecting a good dataset. In PDNA, instead, in some cases JRC staff had difficulty recognizing the houses with the small PDA screen.

Chile Earthquake - Windows Internet Explorer

http://lunar.jrc.it/MissionTracker/ChileEarthquake/tabid/90/Default.aspx

File Edit View Favorites Tools Help

139.191.142.38 localhost ... Consultingweb.it Webmail DigitalGlobe® ImageLibrary ... GDACS HEDIS Lebanon web site DGRELEX LOG Iscrizioni News

Gmail - Posta l... GDACS impac... Silverlight Sho... Met Office: V... Chile Eart... NASA Sensor...

Mode: View Edit

## Mission Tracker

Friday, April 16, 2010 14:35

Chile Earthquake chile Logout

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### Chile Earthquake

This section will contain all the field reporting measurements performed during the JRC mission in the Chile Disaster areas performed in the period **25-31 March 2010**. Additionally, as a reference, a mission compiled with SWAN calculations is also included, to give the possibility to download the data to a PDA.

DATE	MISSIONS	DESC
21/03/2010 07:48	SWAN Calcs	SWAN calculations, 0.5 min flenght= 398 * km fwidth= 111 * km strike= 24 * degree (geog North=0) slip= 7,96 * m dip= 14 * degree rake= 86 * degree depth= 36 * km
25/03/2010 12:03	aa_chile_25032010_1	aa_chile_25032010_1
27/03/2010 11:26	aa_chile_27032010_1a	aa_chile_27032010_1
28/03/2010 11:00	aa_chile_28032010_1	aa_chile_28032010_1
28/03/2010 14:55	aa_chile_28032010_2	aa_chile_28032010_2
29/03/2010 05:30	ricoch_27032010	
29/03/2010 14:11	Ricoh_27032010	Pictures taken with Ricoh camera on 27th March 2010
29/03/2010 05:42	ricoch_28032010	
29/03/2010 15:06	aa_chile_29092010_2	aa_chile_29092010_2
29/03/2010 12:26	aa_chile_29032010_1	aa_chile_29032010_1
30/03/2010 11:58	aa_ricoh_29032010	
30/03/2010 12:52	aa_chile_30032010_1	aa_30032010_1
30/03/2010 14:43	aa-30032010-2	aa-30032010-3
01/04/2010 21:39	Full_Mission	
07/04/2010 18:03	Full_Mission_Nikon	
08/04/2010 12:15	Full_Mission_Angelika	Pictures taken by Angelika
12/04/2010 17:39	Full_Mission_Ricoh	All pictures taken with Ricoh camera

### Maps and Documents

**FRT Mission Chile General Map - 29-30 March 2010**  
Wednesday, March 31, 2010 2:43 PM  
Path and locations visited in the Day 3 and 4 of Annunziato-Franchello-Barberopoulou mission

**FRT Mission in Chile 28 March 2010 - Costitucion**  
Monday, March 29, 2010 6:18 PM  
FRT Mission in Chile 28 March 2010 - Costitucion

**FRT Mission in Chile 28 March 2010 - South of Costitucion**  
Monday, March 29, 2010 6:15 PM  
FRT Mission in Chile 28 March 2010 - South of Costitucion

**Figure 49 - The home page for the Chile mission on the MissionTracker portal of the JRC**

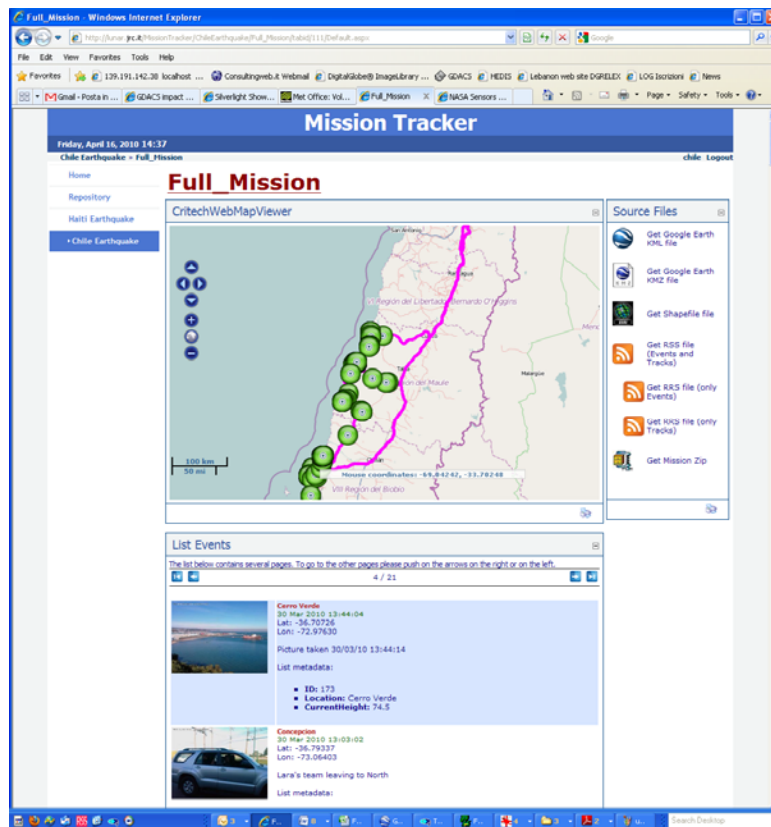


Figure 50 – One of the missions page, with an interactive map with the events and the tracks.



Figure 51 - Example of a map produced by the JRC staff during the mission



## 6 Post survey briefing to UNESCO

After the mission a debriefing was done at UNESCO headquarter in Santiago. A number of points have been raised that could be useful also for other missions

- **Concepcion:** it is important for the groups that will go to request the “Salvacondotto”, that is a document that allows to a) enter in closed areas like Dichato b) not being blocked by the police if one returns late in the evening. The Salvacondotto can be requested at the “Comando de Operaciones Terrestre” at lat: -36.8255 and lon: -73.0459
- **Talcahuano:** we were unable to enter the Naval base of Talcahuano where we wanted to check the physical location of the mareograph present there; we left this request to UNESCO and possibly to other groups that will survey. It would be extremely important if someone can go and report.
- **Coliumo:** given the great interest, the data collected in Coliumo could be in the future be used for an International Standard Problem on inundation and we proposed it also to UNESCO. Thus it would be important if other groups could collect other data there.
- It is very important that the new group receive instruction on how to correctly measure the water height, even showing simple examples because otherwise the first measures may be not very accurate. Although we received some indications during the briefing, we did not have some important information on how to get the “real” current sea level.

## 7 Conclusions

The Tsunami survey in Chile was rather difficult due to the large area needed to be covered in a short time. The coast surveyed (Lloca to Arauco) spans about 250 km from the 700 km affected by the tsunami, thus only selected visits were made.

From the places our team visited, the largest damage from the tsunami were reported in Constitución, Talcahuano, Concepcion, Dichato and Coliumo bays, Pelluhe and Curanipe. The highest run-up value of 26m was measured in Constitución and was considered not representative of the area but rather due to fairly local changes in topography. The maximum water heights measured in different locations varied from 3 to 11 m.

Uplift in the order of 1-2 m was noted south of Talcahuano (Desembocadura de Bio Bio), in Lota, Laraquete and Arauco.

Despite the limited time - 4 days –a rather large and detailed amount of data was collected, also thanks to the efficiency of the FRT software developed by JRC.

A complete comparison of the results of the survey with code calculations has not yet been performed and was out of the scope of this report. However preliminary analysis shows a good match of the level heights in the central part of the tsunami affected area and a less good comparison in the southern part. It will be necessary however to combine all the teams findings in order to have a more complete picture. In particular also the findings of the GPS measurements that University of Santiago is carrying out will be very important for the assessment of the initial fault mechanism.

## Acknowledgments

The authors would like to thank: the National Science Foundation for providing the funds for Professor Barberopoulou's trip to Chile by recommendation of Professor Synolakis at USC; Laura Kong (NOAA) and UNESCO for providing logistical support in Santiago and for the overall organization and coordination of the survey; Professor Sergio Barrientos from Chile University, scientific director of the Chilean Seismological Network for help in the mission preparation and for the useful discussions before and after the mission.



## 8 Appendix A - Tidal Data

The data used for the tidal height correction are listed below. The programme used (WXtide32, <http://wxtide32.com>) contains a limited number of locations. Therefore for each location the closest value was used from the four provided:

- Talcahuano
- Curanipe
- Constitucion, Rio Maule
- Coliumo Bay

### 8.1 Talcahuano, Bahia Concepcion

Valparaiso, Chile + Corrections: High(+0:24, +0.10), Low(+0:23, -0.10)

Units of distance are meters, timezone is UTC

1.50 0:00 03-26	1.64 0:00 03-27	1.64 0:00 03-28	1.48 0:00 03-29	1.20 0:00 03-30
1.34 1:00	1.57 1:00	1.70 1:00	1.68 1:00	1.51 1:00
1.10 2:00	1.37 2:00	1.60 2:00	1.72 2:00	1.68 2:00
0.84 3:00	1.09 3:00	1.35 3:00	1.57 3:00	1.67 3:00
0.61 4:00	0.78 4:00	1.02 4:00	1.28 4:00	1.48 4:00
0.46 5:00	0.51 5:00	0.67 5:00	0.91 5:00	1.15 5:00
0.42 6:00	0.35 6:00	0.40 6:00	0.55 6:00	0.77 6:00
0.48 7:00	0.33 7:00	0.26 7:00	0.29 7:00	0.43 7:00
0.64 8:00	0.44 8:00	0.28 8:00	0.20 8:00	0.22 8:00
0.84 9:00	0.66 9:00	0.46 9:00	0.29 9:00	0.20 9:00
1.04 10:00	0.93 10:00	0.75 10:00	0.54 10:00	0.36 10:00
1.17 11:00	1.17 11:00	1.07 11:00	0.89 11:00	0.68 11:00
1.21 12:00	1.32 12:00	1.34 12:00	1.24 12:00	1.06 12:00
1.15 13:00	1.36 13:00	1.49 13:00	1.51 13:00	1.42 13:00
1.01 14:00	1.25 14:00	1.48 14:00	1.63 14:00	1.66 14:00
0.82 15:00	1.05 15:00	1.32 15:00	1.57 15:00	1.73 15:00
0.65 16:00	0.80 16:00	1.05 16:00	1.34 16:00	1.60 16:00
0.54 17:00	0.57 17:00	0.73 17:00	1.01 17:00	1.32 17:00
0.54 18:00	0.43 18:00	0.47 18:00	0.65 18:00	0.94 18:00
0.66 19:00	0.43 19:00	0.32 19:00	0.37 19:00	0.57 19:00
0.87 20:00	0.57 20:00	0.33 20:00	0.23 20:00	0.30 20:00
1.13 21:00	0.82 21:00	0.51 21:00	0.27 21:00	0.19 21:00
1.39 22:00	1.13 22:00	0.81 22:00	0.49 22:00	0.27 22:00
1.57 23:00	1.43 23:00	1.16 23:00	0.83 23:00	0.52 23:00

## 8.2 Curanipe

Valparaiso, Chile + Corrections: High(+0:50 -1.00) Low(+0:50 -1.00)

Units of distance are meters, timezone is UTC

1.21 0:00 03-26	1.30 0:00 03-27	1.23 0:00 03-28	1.03 0:00 03-29	0.73 0:00 03-30
1.09 1:00	1.29 1:00	1.36 1:00	1.28 1:00	1.06 1:00
0.89 2:00	1.15 2:00	1.33 2:00	1.39 2:00	1.30 2:00
0.65 3:00	0.90 3:00	1.15 3:00	1.32 3:00	1.36 3:00
0.42 4:00	0.61 4:00	0.86 4:00	1.10 4:00	1.25 4:00
0.24 5:00	0.33 5:00	0.52 5:00	0.76 5:00	0.99 5:00
0.15 6:00	0.13 6:00	0.22 6:00	0.40 6:00	0.63 6:00
0.16 7:00	0.05 7:00	0.02 7:00	0.11 7:00	0.28 7:00
0.28 8:00	0.10 8:00	-0.03 8:00	-0.06 8:00	0.02 8:00
0.45 9:00	0.27 9:00	0.08 9:00	-0.05 9:00	-0.09 9:00
0.64 10:00	0.50 10:00	0.32 10:00	0.13 10:00	-0.01 10:00
0.80 11:00	0.75 11:00	0.62 11:00	0.43 11:00	0.24 11:00
0.87 12:00	0.94 12:00	0.91 12:00	0.78 12:00	0.59 12:00
0.86 13:00	1.02 13:00	1.11 13:00	1.08 13:00	0.95 13:00
0.76 14:00	0.98 14:00	1.17 14:00	1.27 14:00	1.24 14:00
0.60 15:00	0.83 15:00	1.08 15:00	1.29 15:00	1.39 15:00
0.43 16:00	0.60 16:00	0.86 16:00	1.13 16:00	1.35 16:00
0.30 17:00	0.37 17:00	0.57 17:00	0.85 17:00	1.13 17:00
0.25 18:00	0.20 18:00	0.29 18:00	0.51 18:00	0.80 18:00
0.32 19:00	0.13 19:00	0.09 19:00	0.19 19:00	0.43 19:00
0.48 20:00	0.21 20:00	0.03 20:00	-0.01 20:00	0.12 20:00
0.71 21:00	0.41 21:00	0.13 21:00	-0.04 21:00	-0.06 21:00
0.97 22:00	0.69 22:00	0.37 22:00	0.10 22:00	-0.06 22:00
1.18 23:00	0.99 23:00	0.70 23:00	0.38 23:00	0.11 23:00

### 8.3 Constitució, Rio Maule ent.

Valparaiso, Chile + Corrections: High(+0:25 -0.20) Low(+0:25 -1.00)

Units of distance are meters, timezone is UTC

1.40 0:00 03-26	1.55 0:00 03-27	1.53 0:00 03-28	1.35 0:00 03-29	1.04 0:00 03-30
1.21 1:00	1.47 1:00	1.61 1:00	1.58 1:00	1.39 1:00
0.94 2:00	1.25 2:00	1.50 2:00	1.62 2:00	1.59 2:00
0.64 3:00	0.93 3:00	1.23 3:00	1.46 3:00	1.58 3:00
0.37 4:00	0.58 4:00	0.85 4:00	1.14 4:00	1.37 4:00
0.20 5:00	0.27 5:00	0.46 5:00	0.73 5:00	1.00 5:00
0.14 6:00	0.09 6:00	0.15 6:00	0.33 6:00	0.57 6:00
0.22 7:00	0.05 7:00	-0.01 7:00	0.03 7:00	0.19 7:00
0.41 8:00	0.18 8:00	0.01 8:00	-0.08 8:00	-0.04 8:00
0.66 9:00	0.44 9:00	0.21 9:00	0.02 9:00	-0.08 9:00
0.90 10:00	0.75 10:00	0.54 10:00	0.30 10:00	0.10 10:00
1.07 11:00	1.04 11:00	0.90 11:00	0.69 11:00	0.45 11:00
1.12 12:00	1.22 12:00	1.21 12:00	1.09 12:00	0.88 12:00
1.05 13:00	1.26 13:00	1.39 13:00	1.40 13:00	1.28 13:00
0.87 14:00	1.15 14:00	1.39 14:00	1.54 14:00	1.56 14:00
0.63 15:00	0.90 15:00	1.21 15:00	1.48 15:00	1.64 15:00
0.41 16:00	0.60 16:00	0.90 16:00	1.22 16:00	1.50 16:00
0.27 17:00	0.33 17:00	0.54 17:00	0.85 17:00	1.18 17:00
0.27 18:00	0.16 18:00	0.22 18:00	0.44 18:00	0.77 18:00
0.40 19:00	0.15 19:00	0.05 19:00	0.12 19:00	0.35 19:00
0.65 20:00	0.31 20:00	0.05 20:00	-0.04 20:00	0.04 20:00
0.95 21:00	0.60 21:00	0.25 21:00	0.00 21:00	-0.09 21:00
1.25 22:00	0.95 22:00	0.59 22:00	0.24 22:00	0.00 22:00
1.47 23:00	1.30 23:00	0.99 23:00	0.62 23:00	0.28 23:00

## 8.4 Bahia Coliumo

Valparaiso, Chile + Corrections: High(+0:30 -0.20) Low(+0:30 -1.00)

Units of distance are meters, timezone is UTC

1.41 0:00 03-26	1.55 0:00 03-27	1.52 0:00 03-28	1.32 0:00 03-29	1.00 0:00 03-30
1.23 1:00	1.49 1:00	1.61 1:00	1.57 1:00	1.36 1:00
0.97 2:00	1.27 2:00	1.52 2:00	1.63 2:00	1.58 2:00
0.66 3:00	0.96 3:00	1.25 3:00	1.48 3:00	1.59 3:00
0.39 4:00	0.60 4:00	0.89 4:00	1.17 4:00	1.39 4:00
0.21 5:00	0.30 5:00	0.49 5:00	0.76 5:00	1.03 5:00
0.14 6:00	0.10 6:00	0.17 6:00	0.36 6:00	0.61 6:00
0.21 7:00	0.05 7:00	-0.01 7:00	0.05 7:00	0.22 7:00
0.39 8:00	0.17 8:00	-0.00 8:00	-0.07 8:00	-0.03 8:00
0.64 9:00	0.41 9:00	0.19 9:00	0.01 9:00	-0.08 9:00
0.88 10:00	0.72 10:00	0.51 10:00	0.27 10:00	0.08 10:00
1.06 11:00	1.02 11:00	0.87 11:00	0.66 11:00	0.42 11:00
1.12 12:00	1.21 12:00	1.19 12:00	1.06 12:00	0.84 12:00
1.06 13:00	1.27 13:00	1.38 13:00	1.38 13:00	1.25 13:00
0.88 14:00	1.16 14:00	1.40 14:00	1.54 14:00	1.54 14:00
0.65 15:00	0.93 15:00	1.23 15:00	1.49 15:00	1.64 15:00
0.43 16:00	0.63 16:00	0.93 16:00	1.25 16:00	1.52 16:00
0.28 17:00	0.35 17:00	0.56 17:00	0.88 17:00	1.22 17:00
0.26 18:00	0.17 18:00	0.25 18:00	0.47 18:00	0.80 18:00
0.39 19:00	0.15 19:00	0.05 19:00	0.14 19:00	0.38 19:00
0.62 20:00	0.29 20:00	0.05 20:00	-0.04 20:00	0.06 20:00
0.93 21:00	0.57 21:00	0.23 21:00	-0.01 21:00	-0.08 21:00
1.23 22:00	0.92 22:00	0.56 22:00	0.22 22:00	-0.01 22:00
1.46 23:00	1.27 23:00	0.95 23:00	0.58 23:00	0.25 23:00



## **9 Appendix B – Detailed events data**

In the following the details of the data collected via the various systems are reported.

- Full Mission HTC
- Full Mission Angelika
- Full Mission Nikon
- Full Mission Ricoh



Mission Report

Mission: Full\_Mission



Event: Licanten

Date/Time: 27/03/2010 16:21:07  
Latitude/Longitude: -71.98741,-34.98547  
Picture taken 27/03/10 16:21:12



List of metadata



Name	Value
Location	Licanten
Current GPS Altitude (m)	28.5

Notes

ID: 2

Event: **Iloca**Date/Time: **27/03/2010 16:56:01**Latitude/Longitude: **-72.17984,-34.99373**

Picture taken 27/03/10 16:56:06

**List of metadata**



Name	Value
Location	Iloca

Notes

ID: 3

Event: **Iloca**Date/Time: **27/03/2010 17:04:06**Latitude/Longitude: **-72.18011,-34.99307**

Tree mark (5.2 m). This is an example of algae left by the Tsunami at an elevation estimated in 5.2 m

**List of metadata**

Name	Value
Location	Iloca
Tide level (m)	0.19
Horizontal Distance (m)	5.2

Notes



ID: 4

Event: Iloca: h=4.9

Date/Time: 27/03/2010 17:04:06

Latitude/Longitude: -72.18011,-34.99307

Picture taken 27/03/10 17:04:10

**List of metadata**

Name	Value
Location	Iloca
Measured height (m)	4.5
Tide level (m)	0.36
Water Height (m)	4.86

Notes



ID: 5

Event: Iloca

Date/Time: 27/03/2010 17:11:45

Latitude/Longitude: -72.18019,-34.99299

Picture taken 27/03/10 17:11:49

**List of metadata**

Name	Value
Location	Iloca
Tide level (m)	0.33
Horizontal Distance (m)	4.8
Current GPS Altitude (m)	-3.4



Notes



ID: 6

Event: Iloca: h=5.7

Date/Time: **27/03/2010 17:11:45**  
 Latitude/Longitude: **-72.18019,-34.99299**  
 Picture taken 27/03/10 17:11:49

**List of metadata**



Name	Value
Location	Iloca
Measured height (m)	5.4
Tide level (m)	0.33
Water Height (m)	5.73
Current GPS Altitude (m)	-3.4

Notes

ID: 7

Event: Iloca: h=6.2

Date/Time: **27/03/2010 17:50:53**  
 Latitude/Longitude: **-72.17832,-34.99393**  
 Marks in the forest (6 m)

**List of metadata**


Name	Value
Location	Iloca
Measured height (m)	6
Tide level (m)	0.22
Water Height (m)	6.22
Current GPS Altitude (m)	16

Notes

ID: 8

Event: **Iloca (wav)**Date/Time: **27/03/2010 17:52:51**Latitude/Longitude: **-72.17831,-34.99386**

Tree marks for our flow depth measurements




**List of metadata**



Name	Value
Location	<b>Iloca</b>
Current GPS Altitude (m)	<b>22</b>

Notes

ID: 9

Event: **Iloca**Date/Time: **27/03/2010 18:04:56**Latitude/Longitude: **-72.17839,-34.98751**

on the road to Ilico

**List of metadata**



Name	Value
Location	<b>Iloca</b>
Current GPS Altitude (m)	<b>32.5</b>

Notes

ID: 10

Event: **Iloca**Date/Time: **27/03/2010 18:13:38**Latitude/Longitude: **-72.18417,-34.96805**

Picture taken 27/03/10 18:13:42

**List of metadata**



Name	Value
Location	<b>Iloca</b>
Current GPS Altitude (m)	<b>27</b>

Notes

ID: 11

Event: **Iloca**Date/Time: **27/03/2010 18:15:04**Latitude/Longitude: **-72.18424,-34.96807**

Picture taken 27/03/10 18:15:10


**List of metadata**

Name	Value
Location	<b>Iloca</b>
Current GPS Altitude (m)	<b>27</b>

Notes

Event: **Iloca**Date/Time: **27/03/2010 18:18:09**Latitude/Longitude: **-72.18457,-34.96829**

Picture taken 27/03/10 18:18:12






**List of metadata**

Name	Value
Location	<b>Iloca</b>
Current GPS Altitude (m)	<b>33.5</b>

Notes

Event: **Iloca**Date/Time: **27/03/2010 18:21:30**Latitude/Longitude: **-72.18476,-34.96792**

Picture taken 27/03/10 18:21:34

**List of metadata**

Name	Value
Location	<b>Iloca</b>
Current GPS Altitude (m)	<b>29.5</b>

Notes



Event: **lloca: h=4.3 (wav)**

Date/Time: 27/03/2010 18:26:13

Latitude/Longitude: -72.18415,-34.96815

3 waves: 5min, 20 min, 30 min. 1st wave did not arrive to the road, the second to the road the third to the top, at the base of the small sand "cumulo". Originally there was a dune of sand that now disappeared.



### List of metadata

<b>Name</b>	<b>Value</b>
Location	<b>Iloca</b>
Measured height (m)	<b>4.1</b>
Tide level (m)	<b>0.15</b>
Water Height (m)	<b>4.25</b>
Horizontal Distance (m)	<b>42.80 M</b>
Current GPS Altitude (m)	<b>31</b>
Target Azimut (Degree)	<b>69.00 D</b>
Inclination (Degree)	<b>3.20 D</b>
Target Latitude (Degree)	<b>-34.968012</b>
Target Longitude (Degree)	<b>-72.183711</b>

## Notes

Event: Iloca: h=4.3

Date/Time: 27/03/2010 18:26:13

Latitude/Longitude: -72.18415,-34.96815

Picture taken 27/03/10 18:26:20





### List of metadata

Name	Value
Location	Iloca
Measured height (m)	4.1
Tide level (m)	0.15
Water Height (m)	4.25
Horizontal Distance (m)	42.80 M
Current GPS Altitude (m)	31
Target Azimut (Degree)	69.00 D
Inclination (Degree)	3.20 D
Target Latitude (Degree)	-34.968012
Target Longitude (Degree)	-72.183711

## Notes

## Event: Iloca

Date/Time: **27/03/2010 18:34:32**  
 Latitude/Longitude: **-72.18444,-34.96742**  
 Picture taken 27/03/10 18:34:37



**List of metadata**

Name	Value
Location	Iloca
Current GPS Altitude (m)	38.5

Notes

## Event: Iloca

Date/Time: **27/03/2010 18:35:34**  
 Latitude/Longitude: **-72.18447,-34.96743**  
 Picture taken 27/03/10 18:35:41



**List of metadata**

Name	Value
Location	Iloca
Current GPS Altitude (m)	39

Notes

Event: **Iloca (wav)**Date/Time: **27/03/2010 18:49:00**Latitude/Longitude: **-72.18416,-34.96709**

Picture taken 27/03/10 18:49:03

**List of metadata**

Name	Value
Location	Iloca
Current GPS Altitude (m)	31.5

Notes

Event: **Iloca (wav)**Date/Time: **27/03/2010 19:09:40**Latitude/Longitude: **-72.17938,-34.92624**

20, 25, 30 minutes the first 3 waves wave. Carabineros alerted all the people there. Several people view the wave




**List of metadata**

Name	Value
Location	Iloca
Current GPS Altitude (m)	27.5



Notes

Event: Iloca: h=5.1

Date/Time: 27/03/2010 19:20:10

Latitude/Longitude: -72.1797,-34.9265

Picture taken 27/03/10 19:20:14

**List of metadata**

Name	Value
Location	Iloca
Measured height (m)	5
Tide level (m)	0.14
Water Height (m)	5.14
Current GPS Altitude (m)	15.5



Notes

Event: Iloca (wav)

Date/Time: 27/03/2010 19:25:36

Latitude/Longitude: -72.17971,-34.92653

Picture taken 27/03/10 19:25:43

**List of metadata**



Name	Value
Location	Iloca
Current GPS Altitude (m)	16.5

Notes



Event: **Iloca**Date/Time: **27/03/2010 19:38:50**Latitude/Longitude: **-72.17959,-34.92655**

Second floor of house moved

**List of metadata**

Name	Value
Location	<b>Iloca</b>
Current GPS Altitude (m)	<b>23.5</b>

Notes

Event: **Iloca**Date/Time: **27/03/2010 19:40:17**Latitude/Longitude: **-72.17958,-34.92653**

Picture taken 27/03/10 19:40:23






**List of metadata**

Name	Value
Location	<b>Iloca</b>
Current GPS Altitude (m)	<b>24.5</b>

Notes

Event: **Iloca (wav)**Date/Time: **27/03/2010 19:58:38**Latitude/Longitude: **-72.18341,-34.9736**

Very high water level but house not damaged due to high elevation and construction with pillars



**List of metadata**

Name	Value
Location	<b>Iloca</b>
Current GPS Altitude (m)	<b>34.5</b>

Notes

Event: **Iloca: h=8.2**Date/Time: **27/03/2010 20:02:19**Latitude/Longitude: **-72.1834,-34.97367**

Picture taken 27/03/10 20:02:23

**List of metadata**


Name	Value
Location	<b>Iloca</b>
Measured height (m)	<b>8</b>
Tide level (m)	<b>0.22</b>
Water Height (m)	<b>8.22</b>
Current GPS Altitude (m)	<b>31.5</b>

Notes

ID: 26

Event: **Iloca (wav)**Date/Time: **27/03/2010 20:06:12**Latitude/Longitude: **-72.18334,-34.97374**

For about 500m - 1 km very shallow water



The left panel shows a map of the Iloca area with labels for La Higuera, Los Treles, La Higuera, Iloca, Las Puercas, Lora, Comunidad El Oquén, Huatón, and El Rodero. A green dot marks the location. The right panel is a photo showing a view of the ocean from a high vantage point, with a red roof visible in the foreground.


List of metadata	
Name	Value
Location	Iloca
Current GPS Altitude (m)	30

Notes

ID: 27

Event: **Iloca (wav)**Date/Time: **27/03/2010 20:11:31**Latitude/Longitude: **-72.17844,-34.99361**

There is a small highland in front of this location, shallow water



The left panel shows a map of the Iloca area with labels for La Higuera, Los Treles, La Higuera, Iloca, Las Puercas, Lora, Comunidad El Oquén, Huatón, and El Rodero. A green dot marks the location. The right panel is a photo showing a view of the ocean from a high vantage point, with a small highland visible in the foreground.



List of metadata	
Name	Value
Location	Iloca
Current GPS Altitude (m)	26

Notes

ID: 28

Event: **Chanquiuque (wav)**Date/Time: **27/03/2010 20:31:28**Latitude/Longitude: **-72.19997,-35.11094**

Very far from shore

**List of metadata**



Name	Value
Location	Chanquiuque
Current GPS Altitude (m)	29.5

Notes

ID: 29

Event: **Chanquiuque**Date/Time: **27/03/2010 20:33:02**Latitude/Longitude: **-72.19975,-35.11106**

Picture taken 27/03/10 20:33:07

**List of metadata**

Name	Value
Location	Chanquiuque
Current GPS Altitude (m)	40

Notes





Event: **Chanquiuque: h=4.3**

Date/Time: **27/03/2010 20:38:10**

Latitude/Longitude: **-72.19979,-35.11104**

Picture taken 27/03/10 20:38:14

List of metadata	
Name	Value
Location	Chanquiuque
Measured height (m)	4
Tide level (m)	0.32
Water Height (m)	4.32
Current GPS Altitude (m)	32



Notes

Event: **Chanquiuque (wav)**

Date/Time: **27/03/2010 20:39:23**

Latitude/Longitude: **-72.19977,-35.11105**

Picture taken 27/03/10 20:39:27






List of metadata	
Name	Value
Location	Chanquiuque
Current GPS Altitude (m)	30

Notes

Event: **Chanquiuque**Date/Time: **27/03/2010 20:53:12**Latitude/Longitude: **-72.20136,-35.11316**

Picture taken 27/03/10 20:53:18



**List of metadata**

Name	Value
Location	Chanquiuque
Current GPS Altitude (m)	26.5

Notes

Event: **Chanquiuque**Date/Time: **27/03/2010 20:53:54**Latitude/Longitude: **-72.20134,-35.11326**

Picture taken 27/03/10 20:54:00



**List of metadata**

Name	Value
Location	Chanquiuque
Current GPS Altitude (m)	25.5

Notes

Event: **Chanquique**Date/Time: **27/03/2010 21:01:44**Latitude/Longitude: **-72.20194, -35.12903**

Picture taken 27/03/10 21:01:49



**List of metadata**

Name	Value
Location	<b>Chanquique</b>
Current GPS Altitude (m)	<b>22.5</b>

Notes

Event: **Constitution**Date/Time: **27/03/2010 21:35:13**Latitude/Longitude: **-72.39932, -35.33876**

Picture taken 27/03/10 21:35:20


**List of metadata**

Name	Value
Location	<b>Constitution</b>
Current GPS Altitude (m)	<b>31</b>

Notes

Event: **Constitution**Date/Time: **27/03/2010 21:36:36**Latitude/Longitude: **-72.39927,-35.33873**

Picture taken 27/03/10 21:36:40




The left panel shows a map of the Constitution site with labels for El Peral, Catán, Junquillar, Constitución, and La Ovejera. A green dot marks the location. The right panel is a photograph of a large, dark, irregular pile of debris and rubble, likely the remains of a building, under a clear blue sky. A small white structure is visible in the background.

List of metadata	
Name	Value
Location	Constitution
Current GPS Altitude (m)	21

Notes

Event: **Constitution**Date/Time: **27/03/2010 21:41:54**Latitude/Longitude: **-72.39918,-35.33874**

Picture taken 27/03/10 21:41:58



The left panel shows a map of the Constitution site with labels for El Peral, Catán, Junquillar, Constitución, and La Ovejera. A green dot marks the location. The right panel is a photograph of a large, white, cylindrical object, possibly a barrel or a small structure, lying on its side. A person is standing next to it for scale. The background shows a dark, irregular pile of debris and rubble.

List of metadata	
Name	Value
Location	Constitution
Current GPS Altitude (m)	26

Notes



ID: 38

Event: **Constitution**

Date/Time: 27/03/2010 21:45:16

Latitude/Longitude: -72.39917,-35.33869

Picture taken 27/03/10 21:45:21



### List of metadata

<b>Name</b>	<b>Value</b>
Location	<b>Constitution</b>
Current GPS Altitude (m)	<b>29</b>

## Notes

ID: 39

Event: **Constitution (wav)**

Date/Time: 27/03/2010 21:52:42

Latitude/Longitude: -72.39917,-35.33864

"The day of the Tsunami my wife was pregnant in the hospital"



### List of metadata



<b>Name</b>	<b>Value</b>
Location	<b>Constitution</b>
Current GPS Altitude (m)	<b>28</b>

## Notes

ID: 40

Event: **Constitution**Date/Time: **27/03/2010 22:01:27**Latitude/Longitude: **-72.39927,-35.33865**



Picture taken 27/03/10 22:01:33

	
List of metadata	
Name	Value
Location	Constitution
Current GPS Altitude (m)	21.5
Notes	

ID: 41

Event: **Constitution**Date/Time: **27/03/2010 22:15:17**Latitude/Longitude: **-72.41038,-35.33184**



Centro medico

	
List of metadata	
Name	Value
Location	Constitution
Notes	

ID: 42

Event: **Constitution**Date/Time: **27/03/2010 22:15:57**Latitude/Longitude: **-72.41038,-35.33184**

Picture taken 27/03/10 22:16:01

**List of metadata**



Name	Value
Location	Constitution

Notes

ID: 43

Event: **Puerto de Maguellines**Date/Time: **27/03/2010 22:41:08**Latitude/Longitude: **-72.45547,-35.35875**

Picture taken 27/03/10 22:41:13



**List of metadata**

Name	Value
Location	Puerto de Maguellines

Notes

Event: **Puerto de Maguellines: h=5.9**

Date/Time: **27/03/2010 22:41:34**  
 Latitude/Longitude: **-72.45547,-35.35877**  
 Picture taken 27/03/10 22:41:39



**List of metadata**

Name	Value
Location	<b>Puerto de Maguellines</b>
Measured height (m)	<b>5</b>
Tide level (m)	<b>0.9</b>
Water Height (m)	<b>5.9</b>

Notes

Event: **Puerto de Maguellines: h=6.9**

Date/Time: **27/03/2010 22:44:41**  
 Latitude/Longitude: **-72.45569,-35.35868**  
 Picture taken 27/03/10 22:44:47

**List of metadata**

Name	Value
Location	<b>Puerto de Maguellines</b>
Measured height (m)	<b>6</b>
Tide level (m)	<b>0.91</b>
Water Height (m)	<b>6.91</b>



Notes



ID: 46

Event: **Puerto de Maguellines**Date/Time: **27/03/2010 22:46:59**Latitude/Longitude: **-72.4555,-35.35893**

Picture taken 27/03/10 22:47:07



List of metadata	
Name	Value
Location	Puerto de Maguellines

Notes

ID: 47

Event: **Constitution (Playa de Rieles)**Date/Time: **27/03/2010 22:58:32**Latitude/Longitude: **-72.43444,-35.33106**

Picture taken 27/03/10 22:58:40



List of metadata	
Name	Value
Location	Constitution (Playa de Rieles)

Notes

ID: 48

Event: **Constitution (Playa de Rieles)**Date/Time: **27/03/2010 22:59:42**Latitude/Longitude: **-72.43447,-35.33104**

Picture taken 27/03/10 22:59:47

**List of metadata**



Name	Value
Location	Constitution (Playa de Rieles)

Notes

ID: 49

Event: **Constitution**Date/Time: **27/03/2010 23:04:42**Latitude/Longitude: **-72.40786,-35.33234**

Picture taken 28/03/10 00:04:47

**List of metadata**

Name	Value
Location	Constitution



Notes

Event: **Consitution (front sea): h=26.2**

Date/Time: **27/03/2010 23:06:13**

Latitude/Longitude: **-72.42536,-35.3259**

Picture taken 27/03/10 23:06:23

List of metadata	
Name	Value
Location	Consitution (front sea)
Measured height (m)	25
Tide level (m)	1.16
Water Height (m)	26.16



Notes

Event: **Road between San Javier and Iloca**

Date/Time: **28/03/2010 12:10:49**

Latitude/Longitude: **-71.90194,-35.58963**

All bridges appear damaged and repaired

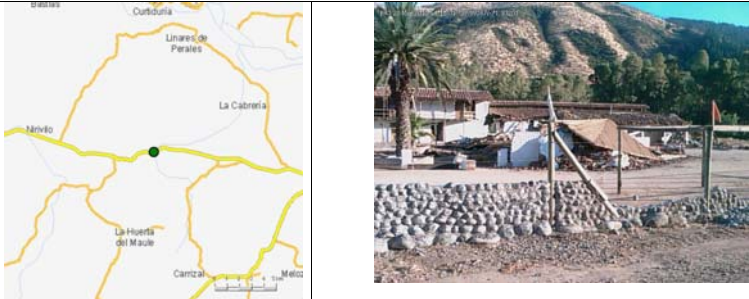



List of metadata	
Name	Value
Location	Road between San Javier and Iloca
Current GPS Altitude (m)	107

Notes

Event: **Road between San Javier and Iloca**Date/Time: **28/03/2010 12:15:01**Latitude/Longitude: **-71.93201,-35.59167**

Picture taken 28/03/10 12:15:05



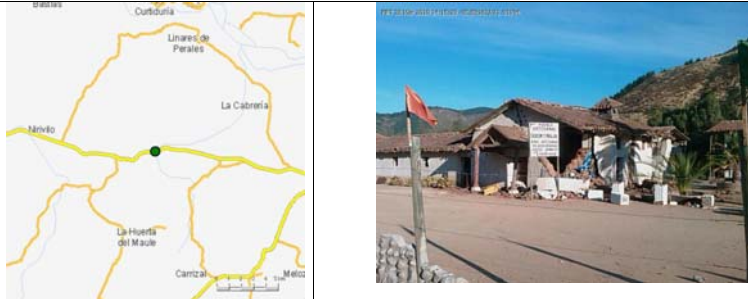
The left panel shows a map with a yellow line indicating the road between San Javier and Iloca. The right panel shows a photograph of the road, which is a dirt road with a stone wall on the left and hills in the background.

List of metadata	
Name	Value
Location	Road between San Javier and Iloca
Current GPS Altitude (m)	123.5

Notes

Event: **Road between San Javier and Iloca**Date/Time: **28/03/2010 12:15:29**Latitude/Longitude: **-71.93194,-35.59163**

Picture taken 28/03/10 12:15:34



The left panel shows a map with a yellow line indicating the road between San Javier and Iloca. The right panel shows a photograph of the road, which is a dirt road with a stone wall on the left and hills in the background.

List of metadata	
Name	Value
Location	Road between San Javier and Iloca
Current GPS Altitude (m)	125

Notes



ID: 54

Event: **Road between San Javier and Iloca (wav)**Date/Time: **28/03/2010 12:35:18**Latitude/Longitude: **-72.15459,-35.54182**

Picture taken 28/03/10 12:35:21



The left panel shows a map with a green dot indicating the location on a road between San Javier and Iloca. The right panel is a photograph taken from a car, showing a paved road stretching into the distance, flanked by trees and vegetation.


List of metadata	
Name	Value
Location	Road between San Javier and Iloca
Current GPS Altitude (m)	202.5

Notes

ID: 55

Event: **Constitution**Date/Time: **28/03/2010 13:05:25**Latitude/Longitude: **-72.41789,-35.34417**

Picture taken 28/03/10 13:05:29



The left panel shows a map with a green dot indicating the location near Constitución. The right panel is a photograph showing a dense residential area with many small houses, likely in a rural or semi-rural setting.


List of metadata	
Name	Value
Location	Constitution
Current GPS Altitude (m)	108

Notes

ID: 56

Event: **Constitution**Date/Time: **28/03/2010 13:06:01**Latitude/Longitude: **-72.4178,-35.34399**

Picture taken 28/03/10 13:06:06



The left panel shows a map of the Constitución area with a green dot indicating the location. The right panel is a photograph showing a view of a residential area with many houses, seen from an elevated position. A red structure is visible in the foreground on the left.


List of metadata	
Name	Value
Location	Constitution
Current GPS Altitude (m)	107.5

Notes

ID: 57

Event: **Constitution**Date/Time: **28/03/2010 13:13:17**Latitude/Longitude: **-72.41778,-35.33143**

Tsunami evacuation sign



The left panel shows a map of the Constitución area with a green dot indicating the location. The right panel is a photograph showing a street scene with a house, a fence, and a yellow tsunami evacuation sign on a pole.


List of metadata	
Name	Value
Location	Constitution
Current GPS Altitude (m)	38

Notes

ID: 58

Event: **Constitution**Date/Time: **28/03/2010 13:20:48**Latitude/Longitude: **-72.41129,-35.33099**

Picture taken 28/03/10 13:20:53



The left panel shows a map of the Constitution area, highlighting the location of the event. The right panel shows a photograph of a large pile of debris, including wood and metal, with a car's rearview mirror visible in the foreground. The photo is timestamped 'PPT 08 Nov 2010 13:20:48 -05:00m 02.41129'.


List of metadata	
Name	Value
Location	Constitution
Current GPS Altitude (m)	29

Notes

ID: 59

Event: **Constitution**Date/Time: **28/03/2010 13:25:26**Latitude/Longitude: **-72.40618,-35.33478**

Picture taken 28/03/10 13:25:30




The left panel shows a map of the Constitution area, highlighting the location of the event. The right panel shows a photograph of a pile of debris, including wood and metal, with a building in the background. The photo is timestamped 'PPT 08 Nov 2010 13:25:26 -05:00m 02.40618'.

List of metadata	
Name	Value
Location	Constitution
Current GPS Altitude (m)	29.5

Notes

ID: 60

Event: **Constitution**Date/Time: **28/03/2010 13:26:13**Latitude/Longitude: **-72.40631,-35.33194**


**List of metadata**



Name	Value
Location	<b>Constitution</b>
Current GPS Altitude (m)	<b>41</b>

Notes

ID: 61

Event: **Constitution**Date/Time: **28/03/2010 13:28:41**Latitude/Longitude: **-72.4042,-35.336586**

Picture taken 28/03/10 13:28:44

**List of metadata**

Name	Value
Location	<b>Constitution</b>
Measured height (m)	<b>0.4</b>
Tide level (m)	<b>1.42</b>
Horizontal Distance (m)	<b>75.30 M</b>
Current GPS Altitude (m)	<b>34.5</b>
Target Azimut (Degree)	<b>40.60 D</b>
Inclination (Degree)	<b>0.30 D</b>
Current Latitude (Degree)	<b>-35.3371</b>
Target Latitude (Degree)	<b>-35.336586</b>
Target Longitude (Degree)	<b>-72.4042</b>

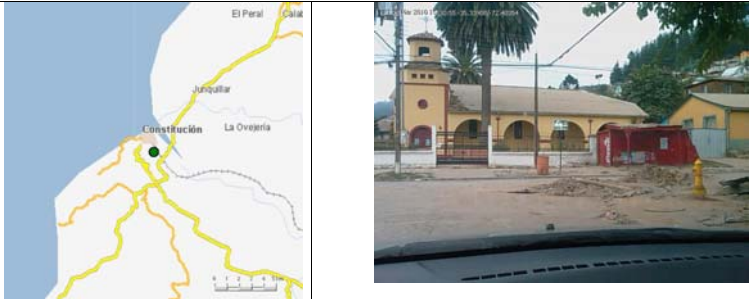
Notes



ID: 62

Event: **Constitution**Date/Time: **28/03/2010 13:30:55**Latitude/Longitude: **-72.40354,-35.33908**

Picture taken 28/03/10 13:31:01



The left panel shows a map of the Constitution area in Ecuador, with labels for El Peral, Junquillar, Constitución, and La Ovejuna. A green dot marks the location. The right panel is a photograph taken from a vehicle, showing a yellow building with a tower, a red container, and a dirt road.


List of metadata	
Name	Value
Location	Constitution
Current GPS Altitude (m)	34

Notes

ID: 63

Event: **Constitution**Date/Time: **28/03/2010 13:36:39**Latitude/Longitude: **-72.39935,-35.33878**

Picture taken 28/03/10 13:36:44



The left panel shows a map of the Constitution area in Ecuador, with labels for El Peral, Junquillar, Constitución, and La Ovejuna. A green dot marks the location. The right panel is a photograph showing a dirt road with debris, a red container, and a yellow building in the background.

List of metadata	
Name	Value
Location	Constitution
Current GPS Altitude (m)	32.5


Notes

ID: 64

Event: **Constitution**

Date/Time: **28/03/2010 13:37:26**

Latitude/Longitude: **-72.41038,-35.33186**



List of metadata	
Name	Value
Location	<b>Constitution</b>
Current GPS Altitude (m)	<b>23.5</b>


Notes

ID: 65

Event: **Constitution**

Date/Time: **28/03/2010 13:42:37**

Latitude/Longitude: **-72.41039,-35.33185**



List of metadata	
Name	Value
Location	<b>Constitution</b>
Current GPS Altitude (m)	<b>24.5</b>



Notes

Event: **Constitution: h=8.6**

Date/Time: **28/03/2010 13:48:15**

Latitude/Longitude: **-72.40508,-35.33421**

Picture taken 28/03/10 13:48:22

List of metadata	
Name	Value
Location	<b>Constitution</b>
Measured height (m)	<b>7.2</b>
Tide level (m)	<b>1.41</b>
Water Height (m)	<b>8.61</b>
Horizontal Distance (m)	<b>4.10 M</b>
Current GPS Altitude (m)	<b>26</b>
Target Azimut (Degree)	<b>95.00 D</b>
Inclination (Degree)	<b>26.60 D</b>
Target Latitude (Degree)	<b>-35.334213</b>
Target Longitude (Degree)	<b>-72.405035</b>



Notes

Event: **Constitution: h=8.5**

Date/Time: **28/03/2010 13:51:44**

Latitude/Longitude: **-72.40509,-35.3342**

Picture taken 28/03/10 13:51:50

List of metadata	
Name	Value
Location	<b>Constitution</b>
Measured height (m)	<b>7.1</b>
Tide level (m)	<b>1.4</b>
Water Height (m)	<b>8.5</b>



Notes

Event: **Constitution: h=8.4**

Date/Time: **28/03/2010 14:00:17**

Latitude/Longitude: **-72.40487,-35.33463**

Picture taken 28/03/10 14:00:23

List of metadata	
Name	Value
Location	<b>Constitution</b>
Measured height (m)	<b>7</b>
Tide level (m)	<b>1.39</b>
Water Height (m)	<b>8.39</b>
Current GPS Altitude (m)	<b>22.5</b>



Notes

Event: **Constitution: h=7.4**

Date/Time: **28/03/2010 14:12:50**

Latitude/Longitude: **-72.405019,-35.334594**

Picture taken 28/03/10 14:12:56

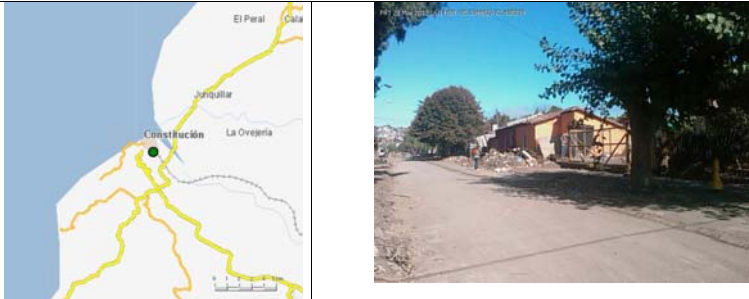



List of metadata	
Name	Value
Location	<b>Constitution</b>
Measured height (m)	<b>6</b>
Tide level (m)	<b>1.39</b>
Water Height (m)	<b>7.39</b>
Horizontal Distance (m)	<b>7.30 M</b>
Current GPS Altitude (m)	<b>28</b>
Target Azimut (Degree)	<b>227.60 D</b>
Inclination (Degree)	<b>11.20 D</b>
Current Latitude (Degree)	<b>-35.33454</b>
Target Latitude (Degree)	<b>-35.334594</b>
Target Longitude (Degree)	<b>-72.405019</b>

Notes

Event: **Constitution: h=7.1**Date/Time: **28/03/2010 14:14:59**Latitude/Longitude: **-72.405279,-35.334482**

Picture taken 28/03/10 14:15:05




The left panel shows a map of the Constitución area with a green dot indicating the measurement location. The right panel is a photograph of a dirt road with a yellow building and trees in the background.

List of metadata	
Name	Value
Location	<b>Constitution</b>
Measured height (m)	<b>5.7</b>
Tide level (m)	<b>1.37</b>
Water Height (m)	<b>7.07</b>
Horizontal Distance (m)	<b>29.40 M</b>
Current GPS Altitude (m)	<b>28.5</b>
Target Azimut (Degree)	<b>280.50 D</b>
Inclination (Degree)	<b>2.10 D</b>
Current Latitude (Degree)	<b>-35.33453</b>
Target Latitude (Degree)	<b>-35.334482</b>
Target Longitude (Degree)	<b>-72.405279</b>

Notes

Event: **Constitution: h=6.7**Date/Time: **28/03/2010 14:16:01**Latitude/Longitude: **-72.405464,-35.334554**

Picture taken 28/03/10 14:16:05



The left panel shows a map of the Constitución area with a green dot indicating the measurement location. The right panel is a photograph of a dirt road with a yellow building and trees in the background.


List of metadata	
Name	Value
Location	<b>Constitution</b>
Measured height (m)	<b>5.3</b>
Tide level (m)	<b>1.36</b>
Water Height (m)	<b>6.66</b>
Horizontal Distance (m)	<b>45.80 M</b>
Current GPS Altitude (m)	<b>29.5</b>
Target Azimut (Degree)	<b>266.70 D</b>
Inclination (Degree)	<b>0.90 D</b>
Current Latitude (Degree)	<b>-35.33453</b>
Target Latitude (Degree)	<b>-35.334554</b>
Target Longitude (Degree)	<b>-72.405464</b>

Notes



Event: **Constitution: h=7.1**Date/Time: **28/03/2010 14:17:21**Latitude/Longitude: **-72.405566,-35.334712**

Picture taken 28/03/10 14:17:24




The left panel shows a map of the study area with a green dot marking the location of 'Constitución'. The right panel is a photograph of a dirt road lined with trees and a yellow building in the background.

List of metadata	
Name	Value
Location	<b>Constitution</b>
Measured height (m)	<b>5.7</b>
Tide level (m)	<b>1.36</b>
Water Height (m)	<b>7.06</b>
Horizontal Distance (m)	<b>59.01 M</b>
Current GPS Altitude (m)	<b>29.5</b>
Target Azimut (Degree)	<b>248.80 D</b>
Inclination (Degree)	<b>1.10 D</b>
Current Latitude (Degree)	<b>-35.33452</b>
Target Latitude (Degree)	<b>-35.334712</b>
Target Longitude (Degree)	<b>-72.405566</b>

Notes

Event: **Constitution: h=6**Date/Time: **28/03/2010 14:20:54**Latitude/Longitude: **-72.405142,-35.335123**

Picture taken 28/03/10 14:21:00



The left panel shows a map of the study area with a green dot marking the location of 'Constitución'. The right panel is a photograph of a yellow building with a dark roof, surrounded by trees and a dirt area.

List of metadata	
Name	Value
Location	<b>Constitution</b>
Measured height (m)	<b>4.6</b>
Tide level (m)	<b>1.35</b>
Water Height (m)	<b>5.95</b>
Horizontal Distance (m)	<b>19.20 M</b>
Current GPS Altitude (m)	<b>31.5</b>
Target Azimut (Degree)	<b>180.60 D</b>
Inclination (Degree)	<b>-0.00 D</b>
Current Latitude (Degree)	<b>-35.33495</b>
Target Latitude (Degree)	<b>-35.335123</b>
Target Longitude (Degree)	<b>-72.405142</b>



Notes

Event: **Constitution: h=7**

Date/Time: **28/03/2010 14:35:05**

Latitude/Longitude: **-72.405549,-35.334693**

Picture taken 28/03/10 14:35:10

**List of metadata**

Name	Value
Location	<b>Constitution</b>
Measured height (m)	<b>5.7</b>
Tide level (m)	<b>1.3</b>
Water Height (m)	<b>7</b>
Horizontal Distance (m)	<b>4.90 M</b>
Current GPS Altitude (m)	<b>30.5</b>
Target Azimut (Degree)	<b>327.90 D</b>
Inclination (Degree)	<b>10.60 D</b>
Current Latitude (Degree)	<b>-35.33473</b>
Target Latitude (Degree)	<b>-35.334693</b>
Target Longitude (Degree)	<b>-72.405549</b>



Notes

Event: **Constitution: h=6.7**

Date/Time: **28/03/2010 14:36:39**

Latitude/Longitude: **-72.405606,-35.334883**

Picture taken 28/03/10 14:36:44


**List of metadata**

Name	Value
Location	<b>Constitution</b>
Measured height (m)	<b>5.4</b>
Tide level (m)	<b>1.3</b>
Water Height (m)	<b>6.7</b>
Horizontal Distance (m)	<b>22.50 M</b>
Current GPS Altitude (m)	<b>31</b>
Target Azimut (Degree)	<b>205.20 D</b>
Inclination (Degree)	<b>1.60 D</b>
Current Latitude (Degree)	<b>-35.3347</b>
Target Latitude (Degree)	<b>-35.334883</b>
Target Longitude (Degree)	<b>-72.405606</b>

Notes

Event: **Constitution: h=6.4**Date/Time: **28/03/2010 14:38:40**Latitude/Longitude: **-72.405863,-35.33493**

Picture taken 28/03/10 14:38:44




The map on the left shows the location of Constitution, Chile, near the coast. The photo on the right shows a street scene in Constitution, Chile, with a person walking in the foreground and buildings in the background.

List of metadata	
Name	Value
Location	<b>Constitution</b>
Measured height (m)	<b>5.1</b>
Tide level (m)	<b>1.29</b>
Water Height (m)	<b>6.39</b>
Horizontal Distance (m)	<b>38.20 M</b>
Current GPS Altitude (m)	<b>27</b>
Target Azimut (Degree)	<b>230.10 D</b>
Inclination (Degree)	<b>0.40 D</b>
Current Latitude (Degree)	<b>-35.33471</b>
Target Latitude (Degree)	<b>-35.33493</b>
Target Longitude (Degree)	<b>-72.405863</b>

Notes

Event: **Constitution: h=6**Date/Time: **28/03/2010 14:42:13**Latitude/Longitude: **-72.406483,-35.335141**

Picture taken 28/03/10 14:42:19





The map on the left shows the location of Constitution, Chile, near the coast. The photo on the right shows a street scene in Constitution, Chile, with a person walking in the foreground and buildings in the background.

List of metadata	
Name	Value
Location	<b>Constitution</b>
Measured height (m)	<b>4.7</b>
Tide level (m)	<b>1.28</b>
Water Height (m)	<b>5.98</b>
Horizontal Distance (m)	<b>50.80 M</b>
Current GPS Altitude (m)	<b>19</b>
Target Azimut (Degree)	<b>261.00 D</b>
Inclination (Degree)	<b>-0.40 D</b>
Current Latitude (Degree)	<b>-35.33507</b>
Target Latitude (Degree)	<b>-35.335141</b>
Target Longitude (Degree)	<b>-72.406483</b>

Notes



Event: **Constitution**Date/Time: **28/03/2010 15:10:00**Latitude/Longitude: **-72.40881,-35.32461**

Picture taken 28/03/10 15:10:05

	
<b>List of metadata</b>	
<b>Name</b>	<b>Value</b>
Location	<b>Constitution</b>
Current GPS Altitude (m)	<b>26</b>
Notes	


Event: **Constitution: h=8.2**Date/Time: **28/03/2010 15:13:33**Latitude/Longitude: **-72.40882,-35.32413**

Picture taken 28/03/10 15:13:36

	
<b>List of metadata</b>	
<b>Name</b>	<b>Value</b>
Location	<b>Constitution</b>
Measured height (m)	<b>7</b>
Tide level (m)	<b>1.15</b>
Water Height (m)	<b>8.15</b>
Notes	

Event: **Constitution**Date/Time: **28/03/2010 15:13:33**Latitude/Longitude: **-72.40882,-35.32413**

Picture taken 28/03/10 15:13:36




The map on the left shows the location of Constitution, Chile, near the border with Argentina. The photo on the right shows a small, partially destroyed building with a curved roof, surrounded by debris and rubble under a clear blue sky.

List of metadata	
Name	Value
Location	Constitution
Current GPS Altitude (m)	30

Notes

Event: **Constitution: h=7.6**Date/Time: **28/03/2010 15:20:29**Latitude/Longitude: **-72.40892,-35.32412**

Picture taken 28/03/10 15:20:35, check and change target lan with the position of the building taken in the picture



The map on the left shows the location of Constitution, Chile, near the border with Argentina. The photo on the right shows a large, multi-story building with a yellow facade, surrounded by debris and rubble under a clear blue sky.

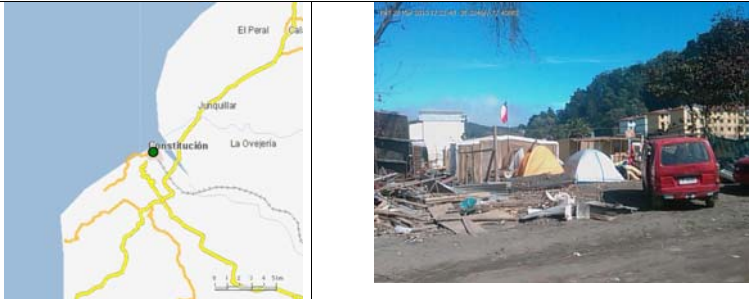
List of metadata	
Name	Value
Location	Constitution
Measured height (m)	6.5
Tide level (m)	1.12
Water Height (m)	7.62
Current GPS Altitude (m)	33

Notes



Event: **Constitution**Date/Time: **28/03/2010 15:22:48**Latitude/Longitude: **-72.40882,-35.32466**

Picture taken 28/03/10 15:22:54



The left panel shows a map of the Constitution area, highlighting the location of the site. The right panel is a photograph of the site, showing a red van parked on a dirt road, with a white tent and other structures in the background.

List of metadata	
Name	Value
Location	Constitution
Current GPS Altitude (m)	32.5

Notes

Event: **Constitution**Date/Time: **28/03/2010 15:35:38**Latitude/Longitude: **-72.40881,-35.32473**

Picture taken 28/03/10 15:35:42



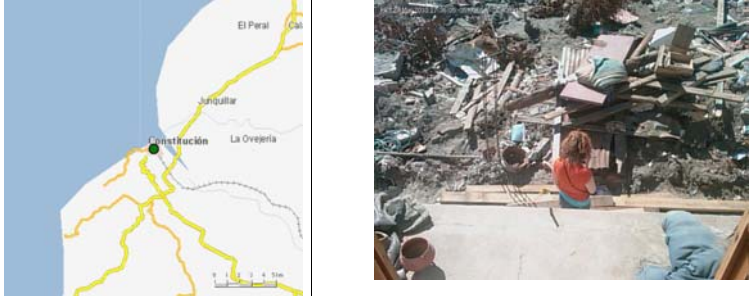
The left panel shows a map of the Constitution area, highlighting the location of the site. The right panel is a photograph of the site, showing a red van parked on a dirt road, with a white tent and other structures in the background.

List of metadata	
Name	Value
Location	Constitution
Current GPS Altitude (m)	32

Notes

Event: **Constitution**Date/Time: **28/03/2010 15:36:05**Latitude/Longitude: **-72.40891,-35.32584**

Picture taken 28/03/10 15:36:09



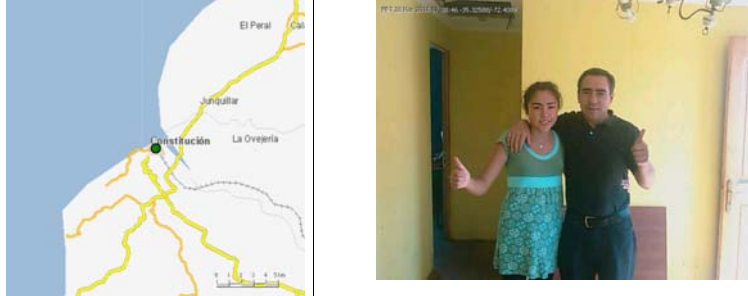
The left panel shows a map of the Constitución area in Chile, with labels for El Parai, Junquillar, Constitución, and La Ovejuna. A green dot marks the location. The right panel is a photograph of a person sitting on a pile of debris and rubble, likely the aftermath of an earthquake.

List of metadata	
Name	Value
Location	Constitution
Current GPS Altitude (m)	32.5

Notes

Event: **Constitution**Date/Time: **28/03/2010 15:38:46**Latitude/Longitude: **-72.4089,-35.32588**

Picture taken 28/03/10 15:38:51



The left panel shows a map of the Constitución area in Chile, with labels for El Parai, Junquillar, Constitución, and La Ovejuna. A green dot marks the location. The right panel is a photograph of a man and a woman standing together indoors, smiling and giving thumbs up.

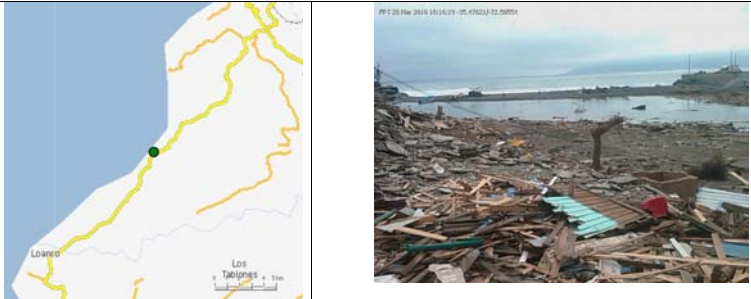
List of metadata	
Name	Value
Location	Constitution
Current GPS Altitude (m)	28.5

Notes

ID: 86

Event: **Caleta Les Pellines (wav)**Date/Time: **28/03/2010 16:16:19**Latitude/Longitude: **-72.50554,-35.47621**

Picture taken 28/03/10 16:16:23



The left panel shows a map of the coastline with a green dot indicating the location of Caleta Les Pellines. The right panel is a photograph showing a beach area covered in debris, including wooden planks and other wreckage, with the ocean in the background.

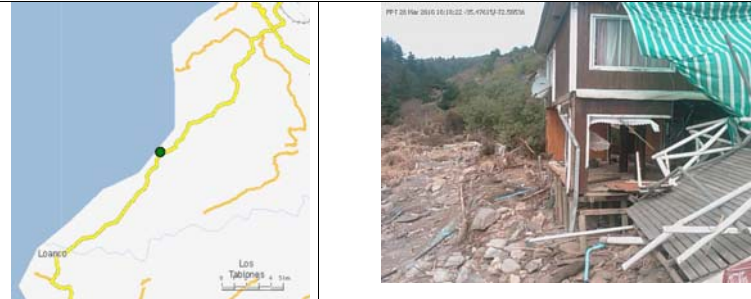
List of metadata	
Name	Value
Location	Caleta Les Pellines
Current GPS Altitude (m)	25

Notes

ID: 87

Event: **Caleta Les Pellines**Date/Time: **28/03/2010 16:18:22**Latitude/Longitude: **-72.50536,-35.47615**

Picture taken 28/03/10 16:18:29





The left panel shows a map of the coastline with a green dot indicating the location of Caleta Les Pellines. The right panel is a photograph showing a building with a green and white striped awning, surrounded by debris and wreckage, with the ocean in the background.

List of metadata	
Name	Value
Location	Caleta Les Pellines
Current GPS Altitude (m)	32

Notes

Event: **Chanco**Date/Time: **28/03/2010 16:58:02**Latitude/Longitude: **-72.53324,-35.73266**

Picture taken 28/03/10 16:58:07



**List of metadata**

Name	Value
Location	<b>Chanco</b>
Current GPS Altitude (m)	<b>80</b>

Notes

Event: **Pelluhue (wav)**Date/Time: **28/03/2010 17:12:55**Latitude/Longitude: **-72.56733,-35.80451**

Picture taken 28/03/10 17:13:00

**List of metadata**

Name	Value
Location	<b>Pelluhue</b>
Current GPS Altitude (m)	<b>39.5</b>

Notes

Event: **Pelluhue (wav)**Date/Time: **28/03/2010 17:15:16**Latitude/Longitude: **-72.56755,-35.80478**

All the area here was covered by houses (confirm in Google Earth), made of wood and cement, until the stadium.



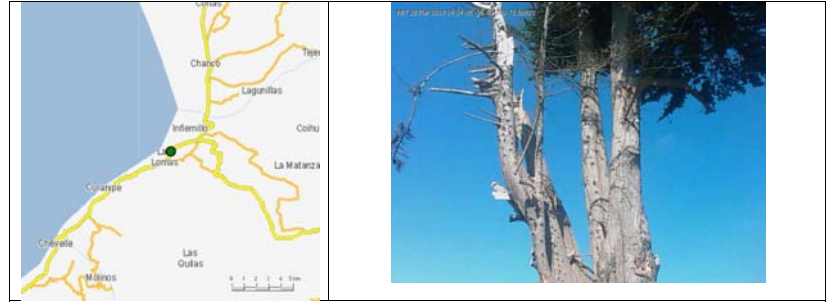
## List of metadata

Name	Value
Location	<b>Pelluhue</b>
Current GPS Altitude (m)	<b>29</b>

Notes

Event: **Pelluhue: h=8.9**Date/Time: **28/03/2010 17:24:05**Latitude/Longitude: **-72.56822,-35.80478**

Picture taken 28/03/10 17:24:09



## List of metadata



Name	Value
Location	<b>Pelluhue</b>
Measured height (m)	<b>8.4</b>
Tide level (m)	<b>0.45</b>
Water Height (m)	<b>8.85</b>
Horizontal Distance (m)	<b>5.20 M</b>
Current GPS Altitude (m)	<b>30</b>
Target Azimut (Degree)	<b>158.60 D</b>
Inclination (Degree)	<b>40.10 D</b>
Target Latitude (Degree)	<b>-35.804824</b>
Target Longitude (Degree)	<b>-72.568199</b>

Notes



Event: **Pelluhue: h=8.4**Date/Time: **28/03/2010 17:37:48**Latitude/Longitude: **-72.56906,-35.80249**

Picture taken 28/03/10 17:37:51



**List of metadata**

Name	Value
Location	<b>Pelluhue</b>
Measured height (m)	<b>8</b>
Tide level (m)	<b>0.39</b>
Water Height (m)	<b>8.39</b>
Current GPS Altitude (m)	<b>23.5</b>

Notes

Event: **Pelluhue: h=9.6**Date/Time: **28/03/2010 17:43:10**Latitude/Longitude: **-72.568778,-35.802533**

Picture taken 28/03/10 17:43:15



**List of metadata**

Name	Value
Location	<b>Pelluhue</b>
Measured height (m)	<b>9.2</b>
Tide level (m)	<b>0.36</b>
Water Height (m)	<b>9.56</b>
Horizontal Distance (m)	<b>29.20 M</b>
Current GPS Altitude (m)	<b>28</b>
Target Azimut (Degree)	<b>134.20 D</b>
Inclination (Degree)	<b>12.30 D</b>
Current Latitude (Degree)	<b>-35.80235</b>
Target Latitude (Degree)	<b>-35.802533</b>
Target Longitude (Degree)	<b>-72.568778</b>

Notes

Event: **Pelluhue: h=9.5**Date/Time: **28/03/2010 17:45:16**Latitude/Longitude: **-72.568121,-35.801994**

Picture taken 28/03/10 17:45:20



**List of metadata**

Name	Value
Location	<b>Pelluhue</b>
Measured height (m)	<b>9.1</b>
Tide level (m)	<b>0.35</b>
Water Height (m)	<b>9.45</b>
Horizontal Distance (m)	<b>71.01 M</b>
Current GPS Altitude (m)	<b>31.5</b>
Target Azimut (Degree)	<b>77.70 D</b>
Inclination (Degree)	<b>4.90 D</b>
Current Latitude (Degree)	<b>-35.80213</b>
Target Latitude (Degree)	<b>-35.801994</b>
Target Longitude (Degree)	<b>-72.568121</b>

Notes

Event: **Pelluhue (wav)**Date/Time: **28/03/2010 17:47:55**Latitude/Longitude: **-72.56854,-35.80153**

Picture taken 28/03/10 17:47:59

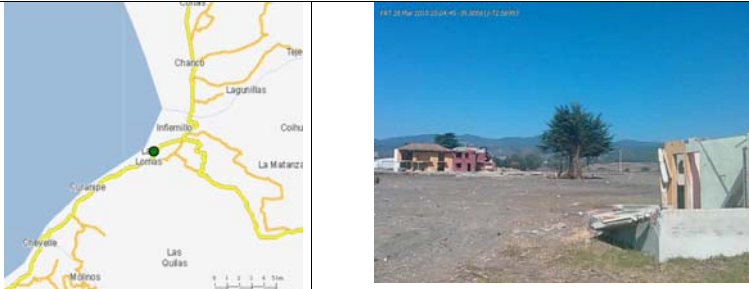
**List of metadata**

Name	Value
Location	<b>Pelluhue</b>
Horizontal Distance (m)	<b>39.50 M</b>
Current GPS Altitude (m)	<b>32.5</b>
Target Azimut (Degree)	<b>223.10 D</b>
Inclination (Degree)	<b>-2.90 D</b>
Target Latitude (Degree)	<b>-35.801789</b>
Target Longitude (Degree)	<b>-72.568839</b>

Notes

Event: **Pelluhue: h=7**Date/Time: **28/03/2010 18:04:45**Latitude/Longitude: **-72.56953,-35.80561**

Picture taken 28/03/10 18:04:52




The left panel shows a map of the Pelluhue area with a green dot indicating the measurement location. The right panel is a photograph of a small, partially damaged building with a red roof and a tree in the foreground.

List of metadata	
Name	Value
Location	<b>Pelluhue</b>
Measured height (m)	<b>6.7</b>
Tide level (m)	<b>0.27</b>
Water Height (m)	<b>6.97</b>
Horizontal Distance (m)	<b>78.30 M</b>
Current GPS Altitude (m)	<b>31.5</b>
Target Azimut (Degree)	<b>135.30 D</b>
Inclination (Degree)	<b>2.70 D</b>
Current Latitude (Degree)	<b>-35.80561</b>
Target Latitude (Degree)	<b>-35.806111</b>
Target Longitude (Degree)	<b>-72.568919</b>

Notes

Event: **Pelluhue: h=5.5**Date/Time: **28/03/2010 18:08:06**Latitude/Longitude: **-72.570509,-35.806606**

Picture taken 28/03/10 18:08:10





The left panel shows a map of the Pelluhue area with a green dot indicating the measurement location. The right panel is a photograph of a tall, metal lattice tower structure in an open field.

List of metadata	
Name	Value
Location	<b>Pelluhue</b>
Measured height (m)	<b>5.2</b>
Tide level (m)	<b>0.25</b>
Water Height (m)	<b>5.45</b>
Horizontal Distance (m)	<b>5.40 M</b>
Current GPS Altitude (m)	<b>29</b>
Target Azimut (Degree)	<b>122.10 D</b>
Inclination (Degree)	<b>23.70 D</b>
Current Latitude (Degree)	<b>-35.80658</b>
Target Latitude (Degree)	<b>-35.806606</b>
Target Longitude (Degree)	<b>-72.570509</b>

Notes

Event: **Pelluhue**Date/Time: **28/03/2010 18:14:34**Latitude/Longitude: **-72.57062,-35.80668**

Picture taken 28/03/10 18:14:38



**List of metadata**

Name	Value
Location	<b>Pelluhue</b>
Current GPS Altitude (m)	<b>27</b>

Notes

Event: **Pelluhue: h=5.6**Date/Time: **28/03/2010 18:17:15**Latitude/Longitude: **-72.569515,-35.807503**

Picture taken 28/03/10 18:17:18



**List of metadata**

Name	Value
Location	<b>Pelluhue</b>
Measured height (m)	<b>5.4</b>
Tide level (m)	<b>0.22</b>
Water Height (m)	<b>5.62</b>
Horizontal Distance (m)	<b>14.80 M</b>
Current GPS Altitude (m)	<b>26.5</b>
Target Azimut (Degree)	<b>174.90 D</b>
Inclination (Degree)	<b>9.40 D</b>
Current Latitude (Degree)	<b>-35.80737</b>
Target Latitude (Degree)	<b>-35.807503</b>
Target Longitude (Degree)	<b>-72.569515</b>

Notes

Event: **Pelluhue: h=7.8**Date/Time: **28/03/2010 18:21:36**Latitude/Longitude: **-72.566478,-35.807916**

Picture taken 28/03/10 18:21:40



**List of metadata**

Name	Value
Location	<b>Pelluhue</b>
Measured height (m)	<b>7.6</b>
Tide level (m)	<b>0.2</b>
Water Height (m)	<b>7.8</b>
Horizontal Distance (m)	<b>276.01 M</b>
Current GPS Altitude (m)	<b>27.5</b>
Target Azimut (Degree)	<b>94.30 D</b>
Inclination (Degree)	<b>0.40 D</b>
Current Latitude (Degree)	<b>-35.80773</b>
Target Latitude (Degree)	<b>-35.807916</b>
Target Longitude (Degree)	<b>-72.566478</b>

Notes

Event: **Pelluhue (wav)**Date/Time: **28/03/2010 18:28:10**Latitude/Longitude: **-72.56914,-35.80714**

Picture taken 28/03/10 18:28:59

**List of metadata**



Name	Value
Location	<b>Pelluhue</b>
Current GPS Altitude (m)	<b>33.5</b>

Notes



Event: **Playa Lovelvan**Date/Time: **28/03/2010 18:38:18**Latitude/Longitude: **-72.59868,-35.82093**

Picture taken 28/03/10 18:38:22



**List of metadata**

Name	Value
Location	<b>Playa Lovelvan</b>
Current GPS Altitude (m)	<b>24.5</b>

Notes

Event: **Playa Lovelvan: h=11.1**Date/Time: **28/03/2010 18:42:23**Latitude/Longitude: **-72.59864,-35.82093**

Picture taken 28/03/10 18:42:28

**List of metadata**

Name	Value
Location	<b>Playa Lovelvan</b>
Measured height (m)	<b>11</b>
Tide level (m)	<b>0.13</b>
Water Height (m)	<b>11.13</b>
Current GPS Altitude (m)	<b>23.5</b>

Notes

Event: **Curanipe**Date/Time: **28/03/2010 18:51:13**Latitude/Longitude: **-72.62311,-35.8357**

Picture taken 28/03/10 18:51:17






**List of metadata**

Name	Value
Location	Curanipe
Current GPS Altitude (m)	24

Notes

Event: **Curanipe**Date/Time: **28/03/2010 19:00:00**Latitude/Longitude: **-72.63906,-35.8435**

Picture taken 28/03/10 19:00:14

**List of metadata**



Name	Value
Location	Curanipe
Current GPS Altitude (m)	23.5

Notes

ID: 106

Event: **Curanipe**Date/Time: **28/03/2010 19:22:59**Latitude/Longitude: **-72.63965,-35.8417**

Picture taken 28/03/10 19:23:21

**List of metadata**

Name	Value
Location	Curanipe
Current GPS Altitude (m)	27.5

Notes

ID: 107

Event: **Curanipe**Date/Time: **28/03/2010 19:23:43**Latitude/Longitude: **-72.63965,-35.84169**

possible uplift






**List of metadata**

Name	Value
Location	Curanipe
Current GPS Altitude (m)	27

Notes

Event: **Curanipe**Date/Time: **28/03/2010 19:24:47**Latitude/Longitude: **-72.639483,-35.841717**

Picture taken 28/03/10 19:24:51



**List of metadata**

Name	Value
Location	Curanipe
Current GPS Altitude (m)	26

Notes

Event: **Curanipe**Date/Time: **28/03/2010 19:33:19**Latitude/Longitude: **-72.63988,-35.8434**

Picture taken 28/03/10 19:33:23



**List of metadata**

Name	Value
Location	Curanipe
Current GPS Altitude (m)	29

Notes

Event: **Curanipe: h=4.5**Date/Time: **28/03/2010 19:39:39**Latitude/Longitude: **-72.63862, -35.84365**

Picture taken 28/03/10 19:39:44



**List of metadata**

Name	Value
Location	Curanipe
Measured height (m)	4.5
Tide level (m)	0.03
Water Height (m)	4.53
Current GPS Altitude (m)	25

Notes

Event: **Curanipe: h=9**Date/Time: **28/03/2010 19:51:42**Latitude/Longitude: **-72.63413, -35.84386**

Picture taken 28/03/10 19:51:47

**List of metadata**

Name	Value
Location	Curanipe
Measured height (m)	9
Tide level (m)	0.03
Water Height (m)	9.03
Current GPS Altitude (m)	32



Notes



ID: 112

Event: **Cauquenes**Date/Time: **28/03/2010 21:02:03**Latitude/Longitude: **-72.33978,-35.9565**

Picture taken 28/03/10 21:02:07

**List of metadata**



Name	Value
Location	<b>Cauquenes</b>
Current GPS Altitude (m)	<b>181.5</b>

Notes

ID: 113

Event: **Cauquenes**Date/Time: **28/03/2010 21:03:03**Latitude/Longitude: **-72.33773,-35.9585**

Picture taken 28/03/10 21:03:09



**List of metadata**

Name	Value
Location	<b>Cauquenes</b>
Current GPS Altitude (m)	<b>180.5</b>

Notes

Event: **Cauquenes**Date/Time: **28/03/2010 21:15:55**Latitude/Longitude: **-72.3155,-35.97412**

Picture taken 28/03/10 21:16:00



**List of metadata**

Name	Value
Location	<b>Cauquenes</b>
Current GPS Altitude (m)	<b>156</b>

Notes

Event: **Cauquenes**Date/Time: **28/03/2010 21:16:31**Latitude/Longitude: **-72.31539,-35.97412**

Picture taken 28/03/10 21:16:37



**List of metadata**

Name	Value
Location	<b>Cauquenes</b>
Current GPS Altitude (m)	<b>157.5</b>

Notes

Event: **Quirihue (wav)**Date/Time: **28/03/2010 22:18:26**Latitude/Longitude: **-72.54641,-36.28536**

Picture taken 28/03/10 22:18:31



**List of metadata**

Name	Value
Location	<b>Quirihue</b>
Current GPS Altitude (m)	<b>278</b>

Notes

Event: **Talcahuano: h=5.5**Date/Time: **29/03/2010 13:26:04**Latitude/Longitude: **-73.105243,-36.725363**

Picture taken 29/03/10 13:26:08



**List of metadata**

Name	Value
Location	<b>Talcahuano</b>
Measured height (m)	<b>3.9</b>
Tide level (m)	<b>1.59</b>
Water Height (m)	<b>5.49</b>
Horizontal Distance (m)	<b>19.01 M</b>
Current GPS Altitude (m)	<b>28.5</b>
Target Azimut (Degree)	<b>244.80 D</b>
Inclination (Degree)	<b>11.70 D</b>
Current Latitude (Degree)	<b>-36.72529</b>
Target Latitude (Degree)	<b>-36.725363</b>
Target Longitude (Degree)	<b>-73.105243</b>

Notes

Event: **Talcahuano: h=5.6**Date/Time: **29/03/2010 13:36:14**Latitude/Longitude: **-73.104372,-36.724697**

Picture taken 29/03/10 13:36:18

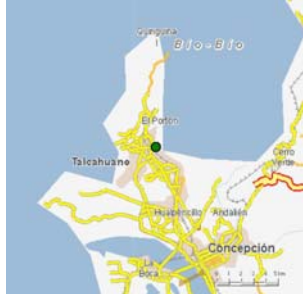

**List of metadata**

Name	Value
Location	<b>Talcahuano</b>
Measured height (m)	<b>4</b>
Tide level (m)	<b>1.61</b>
Water Height (m)	<b>5.61</b>
Horizontal Distance (m)	<b>15.20 M</b>
Current GPS Altitude (m)	<b>35.5</b>
Target Azimut (Degree)	<b>319.10 D</b>
Inclination (Degree)	<b>5.40 D</b>
Current Latitude (Degree)	<b>-36.7248</b>
Target Latitude (Degree)	<b>-36.724697</b>
Target Longitude (Degree)	<b>-73.104372</b>

Notes

Event: **Talcahuano**Date/Time: **29/03/2010 13:40:36**Latitude/Longitude: **-73.104323,-36.724346**

Picture taken 29/03/10 13:40:41

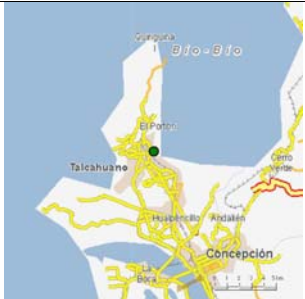

**List of metadata**

Name	Value
Location	<b>Talcahuano</b>
Measured height (m)	<b>-22.1 M</b>
Tide level (m)	<b>1.62</b>
Horizontal Distance (m)	<b>45.00 M</b>
Current GPS Altitude (m)	<b>30.5</b>
Target Azimut (Degree)	<b>356.20 D</b>
Inclination (Degree)	<b>25.70 D</b>
Current Latitude (Degree)	<b>-36.72475</b>
Target Latitude (Degree)	<b>-36.724346</b>
Target Longitude (Degree)	<b>-73.104323</b>

Notes

Event: **Talcahuano: h=8.2**Date/Time: **29/03/2010 13:48:19**Latitude/Longitude: **-73.104462,-36.723935**

Picture taken 29/03/10 13:48:22

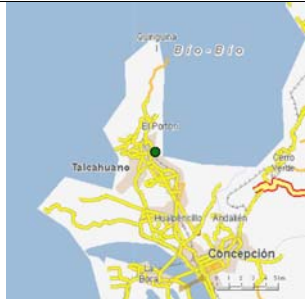

**List of metadata**

Name	Value
Location	<b>Talcahuano</b>
Measured height (m)	<b>6.6</b>
Tide level (m)	<b>1.62</b>
Water Height (m)	<b>8.22</b>
Horizontal Distance (m)	<b>27.00 M</b>
Current GPS Altitude (m)	<b>34.5</b>
Target Azimut (Degree)	<b>266.50 D</b>
Inclination (Degree)	<b>8.50 D</b>
Current Latitude (Degree)	<b>-36.72392</b>
Target Latitude (Degree)	<b>-36.723935</b>
Target Longitude (Degree)	<b>-73.104462</b>

Notes

Event: **Talcahuano: h=5.9**Date/Time: **29/03/2010 13:49:01**Latitude/Longitude: **-73.10418,-36.72391**

Picture taken 29/03/10 13:49:06

**List of metadata**

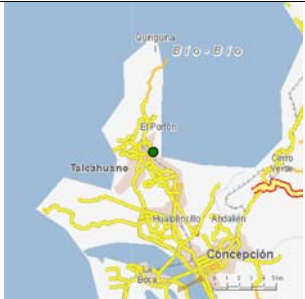

Name	Value
Location	<b>Talcahuano</b>
Measured height (m)	<b>4.3</b>
Tide level (m)	<b>1.62</b>
Water Height (m)	<b>5.92</b>
Horizontal Distance (m)	<b>37.00 M</b>
Current GPS Altitude (m)	<b>31.5</b>
Target Azimut (Degree)	<b>329.80 D</b>
Inclination (Degree)	<b>2.70 D</b>
Current Latitude (Degree)	<b>-36.72391</b>

Notes



Event: **Talcahuano: h=6**Date/Time: **29/03/2010 13:56:55**Latitude/Longitude: **-73.104785,-36.723362**

Picture taken 29/03/10 13:56:59

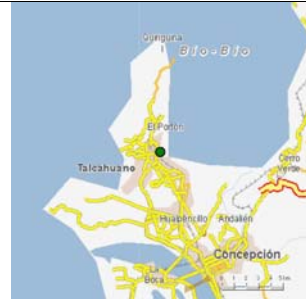

**List of metadata**

Name	Value
Location	<b>Talcahuano</b>
Measured height (m)	<b>4.4</b>
Tide level (m)	<b>1.63</b>
Water Height (m)	<b>6.03</b>
Horizontal Distance (m)	<b>29.50 M</b>
Current GPS Altitude (m)	<b>22.5</b>
Target Azimut (Degree)	<b>312.20 D</b>
Inclination (Degree)	<b>3.80 D</b>
Current Latitude (Degree)	<b>-36.72354</b>
Target Latitude (Degree)	<b>-36.723362</b>
Target Longitude (Degree)	<b>-73.104785</b>

Notes

Event: **Talcahuano: h=6.2**Date/Time: **29/03/2010 13:56:55**Latitude/Longitude: **-73.104785,-36.723362**

Picture taken 29/03/10 13:56:59

**List of metadata**



Name	Value
Location	<b>Talcahuano</b>
Measured height (m)	<b>4.6</b>
Tide level (m)	<b>1.63</b>
Water Height (m)	<b>6.23</b>
Horizontal Distance (m)	<b>29.50 M</b>
Current GPS Altitude (m)	<b>22.5</b>
Target Azimut (Degree)	<b>312.20 D</b>
Inclination (Degree)	<b>3.80 D</b>
Current Latitude (Degree)	<b>-36.72354</b>
Target Latitude (Degree)	<b>-36.723362</b>
Target Longitude (Degree)	<b>-73.104785</b>

Notes

ID: 124

Event: **Talcahuano**Date/Time: **29/03/2010 13:59:41**Latitude/Longitude: **-73.10428,-36.72358**

Picture taken 29/03/10 14:00:06



List of metadata	
Name	Value
Location	Talcahuano
Current GPS Altitude (m)	31.5

Notes

ID: 125

Event: **Talcahuano**Date/Time: **29/03/2010 14:10:32**Latitude/Longitude: **-73.10444,-36.72487**

Picture taken 29/03/10 14:10:38

List of metadata	
Name	Value
Location	Talcahuano
Current GPS Altitude (m)	29.5



Notes

Event: **Talcahuano: h=5.5 (wav)**

Date/Time: **29/03/2010 14:13:35**

Latitude/Longitude: **-73.104637,-36.724596**

Picture taken 29/03/10 14:13:40

**List of metadata**

Name	Value
Location	<b>Talcahuano</b>
Measured height (m)	<b>3.9</b>
Tide level (m)	<b>1.64</b>
Water Height (m)	<b>5.54</b>
Horizontal Distance (m)	<b>32.40 M</b>
Current GPS Altitude (m)	<b>23.5</b>
Target Azimut (Degree)	<b>323.30 D</b>
Inclination (Degree)	<b>1.90 D</b>
Current Latitude (Degree)	<b>-36.72483</b>
Target Latitude (Degree)	<b>-36.724596</b>
Target Longitude (Degree)	<b>-73.104637</b>


Notes

Event: **Talcahuano: h=5.5**

Date/Time: **29/03/2010 14:13:35**

Latitude/Longitude: **-73.104637,-36.724596**

Picture taken 29/03/10 14:13:40



**List of metadata**

Name	Value
Location	<b>Talcahuano</b>
Measured height (m)	<b>3.9</b>
Tide level (m)	<b>1.64</b>
Water Height (m)	<b>5.54</b>
Horizontal Distance (m)	<b>32.40 M</b>
Current GPS Altitude (m)	<b>23.5</b>
Target Azimut (Degree)	<b>323.30 D</b>
Inclination (Degree)	<b>1.90 D</b>
Current Latitude (Degree)	<b>-36.72483</b>
Target Latitude (Degree)	<b>-36.724596</b>
Target Longitude (Degree)	<b>-73.104637</b>

Notes

Event: **Talcahuano**Date/Time: **29/03/2010 14:24:38**Latitude/Longitude: **-73.10469,-36.72503**

Picture taken 29/03/10 14:24:43



**List of metadata**

Name	Value
Location	<b>Talcahuano</b>
Current GPS Altitude (m)	<b>30</b>

Notes

Event: **Talcahuano: h=4.9**Date/Time: **29/03/2010 14:25:32**Latitude/Longitude: **-73.104853,-36.725041**

Picture taken 29/03/10 14:25:36



**List of metadata**

Name	Value
Location	<b>Talcahuano</b>
Measured height (m)	<b>3.3</b>
Tide level (m)	<b>1.63</b>
Water Height (m)	<b>4.93</b>
Horizontal Distance (m)	<b>14.60 M</b>
Current GPS Altitude (m)	<b>30</b>
Target Azimut (Degree)	<b>265.20 D</b>
Inclination (Degree)	<b>1.40 D</b>
Current Latitude (Degree)	<b>-36.72503</b>
Target Latitude (Degree)	<b>-36.725041</b>
Target Longitude (Degree)	<b>-73.104853</b>

Notes

Event: **Talcahuano: h=4.2**Date/Time: **29/03/2010 14:28:53**Latitude/Longitude: **-73.104727,-36.725507**

Picture taken 29/03/10 14:28:58



**List of metadata**

Name	Value
Location	<b>Talcahuano</b>
Measured height (m)	<b>2.6</b>
Tide level (m)	<b>1.63</b>
Water Height (m)	<b>4.23</b>
Horizontal Distance (m)	<b>53.20 M</b>
Current GPS Altitude (m)	<b>32</b>
Target Azimut (Degree)	<b>183.60 D</b>
Inclination (Degree)	<b>-0.30 D</b>
Current Latitude (Degree)	<b>-36.72503</b>
Target Latitude (Degree)	<b>-36.725507</b>
Target Longitude (Degree)	<b>-73.104727</b>

Notes

Event: **Talcahuano**Date/Time: **29/03/2010 14:31:53**Latitude/Longitude: **-73.105224,-36.725282**

this is not tsunami height, is for the bottom of the boat

**List of metadata**



Name	Value
Location	<b>Talcahuano</b>
Measured height (m)	<b>-0.8 M</b>
Tide level (m)	<b>1.62</b>
Horizontal Distance (m)	<b>55.80 M</b>
Current GPS Altitude (m)	<b>33</b>
Target Azimut (Degree)	<b>238.50 D</b>
Inclination (Degree)	<b>-2.20 D</b>
Current Latitude (Degree)	<b>-36.72502</b>
Target Latitude (Degree)	<b>-36.725282</b>
Target Longitude (Degree)	<b>-73.105224</b>

Notes



Event: **Talcahuano: h=4.6**Date/Time: **29/03/2010 14:37:36**Latitude/Longitude: **-73.104413,-36.725491**

Picture taken 29/03/10 14:37:40


**List of metadata**

Name	Value
Location	<b>Talcahuano</b>
Measured height (m)	<b>3</b>
Tide level (m)	<b>1.62</b>
Water Height (m)	<b>4.62</b>
Horizontal Distance (m)	<b>12.40 M</b>
Current GPS Altitude (m)	<b>28</b>
Target Azimut (Degree)	<b>100.70 D</b>
Inclination (Degree)	<b>5.10 D</b>
Current Latitude (Degree)	<b>-36.72547</b>
Target Latitude (Degree)	<b>-36.725491</b>
Target Longitude (Degree)	<b>-73.104413</b>

Notes

Event: **Talcahuano: h=3.4**Date/Time: **29/03/2010 14:40:41**Latitude/Longitude: **-73.104522,-36.725531**

second mark, same position 29/03/10 14:40:45


**List of metadata**

Name	Value
Location	<b>Talcahuano</b>
Measured height (m)	<b>1.8</b>
Tide level (m)	<b>1.62</b>
Water Height (m)	<b>3.42</b>
Horizontal Distance (m)	<b>12.30 M</b>
Current GPS Altitude (m)	<b>18</b>
Target Azimut (Degree)	<b>111.90 D</b>
Inclination (Degree)	<b>-0.60 D</b>
Current Latitude (Degree)	<b>-36.72549</b>
Target Latitude (Degree)	<b>-36.725531</b>
Target Longitude (Degree)	<b>-73.104522</b>

Notes

Event: **Talcahuano: h=3**Date/Time: **29/03/2010 14:42:06**Latitude/Longitude: **-73.104527,-36.725534**

Third mark: another mark at 1.1






**List of metadata**

Name	Value
Location	<b>Talcahuano</b>
Measured height (m)	<b>1.4</b>
Tide level (m)	<b>1.61</b>
Water Height (m)	<b>3.01</b>
Horizontal Distance (m)	<b>12.40 M</b>
Current GPS Altitude (m)	<b>15.5</b>
Target Azimut (Degree)	<b>107.50 D</b>
Inclination (Degree)	<b>-2.30 D</b>
Current Latitude (Degree)	<b>-36.7255</b>
Target Latitude (Degree)	<b>-36.725534</b>
Target Longitude (Degree)	<b>-73.104527</b>

Notes

Event: **Talcahuano**Date/Time: **29/03/2010 14:44:50**Latitude/Longitude: **-73.10464,-36.72544**

base of boat



**List of metadata**

Name	Value
Location	<b>Talcahuano</b>
Current GPS Altitude (m)	<b>18</b>

Notes

Event: **Talcahuano (wav)**Date/Time: **29/03/2010 14:50:19**Latitude/Longitude: **-73.10464,-36.72545**

Picture taken 29/03/10 14:50:24


**List of metadata**

Name	Value
Location	<b>Talcahuano</b>
Current GPS Altitude (m)	<b>22.5</b>

Notes

Event: **Talcahuano: h=3.9**Date/Time: **29/03/2010 14:58:03**Latitude/Longitude: **-73.106352,-36.725092**

Picture taken 29/03/10 14:58:21




**List of metadata**



Name	Value
Location	<b>Talcahuano</b>
Measured height (m)	<b>2.3</b>
Tide level (m)	<b>1.58</b>
Water Height (m)	<b>3.88</b>
Horizontal Distance (m)	<b>43.10 M</b>
Current GPS Altitude (m)	<b>29</b>
Target Azimut (Degree)	<b>290.80 D</b>
Inclination (Degree)	<b>0.50 D</b>
Current Latitude (Degree)	<b>-36.72523</b>
Target Latitude (Degree)	<b>-36.725092</b>
Target Longitude (Degree)	<b>-73.106352</b>

Notes

ID: 138

Event: **Talcahuano**Date/Time: **29/03/2010 15:24:21**Latitude/Longitude: **-73.11472,-36.70992**

Picture taken 29/03/10 15:24:27

**List of metadata**



Name	Value
Location	<b>Talcahuano</b>
Current GPS Altitude (m)	<b>29</b>

Notes

ID: 139

Event: **Talcahuano**Date/Time: **29/03/2010 15:25:00**Latitude/Longitude: **-73.11471,-36.70982**

Picture taken 29/03/10 15:25:04



**List of metadata**

Name	Value
Location	<b>Talcahuano</b>
Current GPS Altitude (m)	<b>31</b>

Notes

Event: **Talcahuano**Date/Time: **29/03/2010 16:10:07**Latitude/Longitude: **-73.11374,-36.70533**

inside base, wait for autor29/03/10 16:10:11


**List of metadata**

Name	Value
Location	Talcahuano
Current GPS Altitude (m)	25.5

Notes

Event: **Talcahuano**Date/Time: **29/03/2010 16:10:33**Latitude/Longitude: **-73.124967,-36.778514**

Enap refinery



**List of metadata**

Name	Value
Location	Talcahuano



Notes



ID: 142

Event: **Talcahuano**Date/Time: **29/03/2010 16:53:10**Latitude/Longitude: **-73.11476,-36.71143**

Enap refinery

**List of metadata**



Name	Value
Location	<b>Talcahuano</b>
Current GPS Altitude (m)	<b>28</b>

Notes

ID: 143

Event: **Talcahuano**Date/Time: **29/03/2010 17:16:08**Latitude/Longitude: **-73.11968,-36.78839**

Enap refinery



**List of metadata**

Name	Value
Location	<b>Talcahuano</b>
Current GPS Altitude (m)	<b>31</b>

Notes

Event: **Talcahuano**Date/Time: **29/03/2010 17:17:04**Latitude/Longitude: **-73.11965,-36.78834**

Enap refinery

29/03/2010 17:17:04

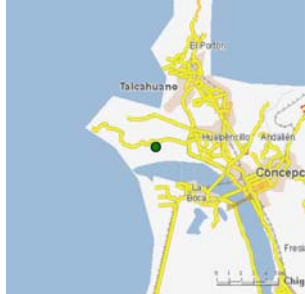

**List of metadata**

Name	Value
Location	<b>Talcahuano</b>
Current GPS Altitude (m)	<b>35</b>

Notes

Event: **Talcahuano**Date/Time: **29/03/2010 17:28:02**Latitude/Longitude: **-73.14955,-36.79157**

Picture taken 29/03/10 17:28:09

29/03/2010 17:28:02

**List of metadata**



Name	Value
Location	<b>Talcahuano</b>
Current GPS Altitude (m)	<b>33</b>

Notes

ID: 146

Event: **Bio Bio River Mouth (wav)**Date/Time: **29/03/2010 17:48:51**Latitude/Longitude: **-73.17316,-36.80888**

Picture taken 29/03/10 17:48:55

**List of metadata**



Name	Value
Location	<b>Bio Bio River Mouth</b>
Current GPS Altitude (m)	<b>31</b>

Notes

ID: 147

Event: **Bio Bio River Mouth**Date/Time: **29/03/2010 17:55:47**Latitude/Longitude: **-73.17317,-36.80889**

Picture taken 29/03/10 17:55:50

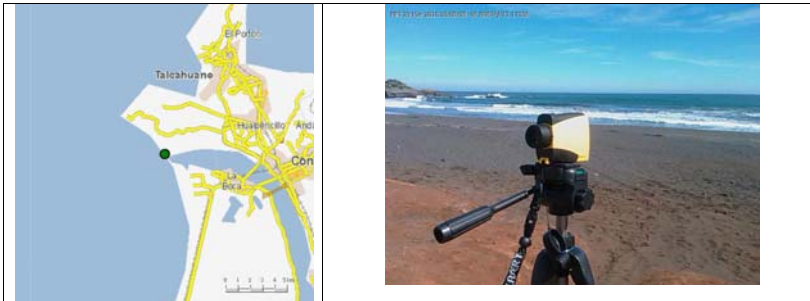
**List of metadata**

Name	Value
Location	<b>Bio Bio River Mouth</b>
Current GPS Altitude (m)	<b>29.5</b>

Notes

Event: **Bio Bio River Mouth: h=5.4**Date/Time: **29/03/2010 18:05:38**Latitude/Longitude: **-73.17336,-36.80876**

Trimble device used for measurements

**List of metadata**

Name	Value
Location	<b>Bio Bio River Mouth</b>
Measured height (m)	<b>4.8</b>
Tide level (m)	<b>0.62</b>
Water Height (m)	<b>5.42</b>
Horizontal Distance (m)	<b>32.90 M</b>
Current GPS Altitude (m)	<b>26.5</b>
Target Azimut (Degree)	<b>261.40 D</b>
Inclination (Degree)	<b>-3.30 D</b>
Target Latitude (Degree)	<b>-36.808804</b>
Target Longitude (Degree)	<b>-73.173725</b>

Notes

Event: **Bio Bio River Mouth**Date/Time: **29/03/2010 18:13:35**Latitude/Longitude: **-73.17447,-36.80836**

All this section seems uplifted and the whole track in this location appear in the water in pre-images. The Director of the park confirmed that fishermen were fishing on the rocks that now are out of the water.



**List of metadata**

Name	Value
Location	<b>Bio Bio River Mouth</b>
Current GPS Altitude (m)	<b>21.5</b>

Notes

Event: **Bio Bio River Mouth**Date/Time: **29/03/2010 18:16:31**Latitude/Longitude: **-73.174556,-36.807961**

top of coral dead



**List of metadata**

Name	Value
Location	<b>Bio Bio River Mouth</b>
Measured height (m)	<b>1.5</b>
Horizontal Distance (m)	<b>3.90 M</b>
Current GPS Altitude (m)	<b>21</b>
Target Azimut (Degree)	<b>91.80 D</b>
Inclination (Degree)	<b>-8.10 D</b>
Current Latitude (Degree)	<b>-36.80796</b>
Target Latitude (Degree)	<b>-36.807961</b>
Target Longitude (Degree)	<b>-73.174556</b>

Notes

Event: **Bio Bio River Mouth**Date/Time: **29/03/2010 18:23:58**Latitude/Longitude: **-73.174594,-36.807989**

Picture taken 29/03/10 18:24:02

**List of metadata**

Name	Value
Location	<b>Bio Bio River Mouth</b>
Measured height (m)	<b>.9 M</b>
Horizontal Distance (m)	<b>3.20 M</b>
Current GPS Altitude (m)	<b>19</b>
Target Azimut (Degree)	<b>88.10 D</b>
Inclination (Degree)	<b>-13.40 D</b>
Current Latitude (Degree)	<b>-36.80799</b>
Target Latitude (Degree)	<b>-36.807989</b>
Target Longitude (Degree)	<b>-73.174594</b>



Notes



ID: 152

Event: **Bio Bio River Mouth**Date/Time: **29/03/2010 18:29:37**Latitude/Longitude: **-73.17451,-36.80802**

Picture taken 29/03/10 18:30:03

**List of metadata**



Name	Value
Location	<b>Bio Bio River Mouth</b>
Current GPS Altitude (m)	<b>19</b>

Notes

ID: 153

Event: **Bio Bio River Mouth**Date/Time: **29/03/2010 18:38:16**Latitude/Longitude: **-73.17403,-36.81191**

Picture taken 29/03/10 18:38:21



**List of metadata**

Name	Value
Location	<b>Bio Bio River Mouth</b>
Current GPS Altitude (m)	<b>20</b>

Notes

Event: **Bio Bio River Mouth**Date/Time: **29/03/2010 18:42:25**Latitude/Longitude: **-73.17396,-36.81196**

Picture taken 29/03/10 18:42:28

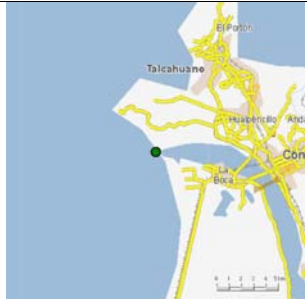

**List of metadata**

Name	Value
Location	<b>Bio Bio River Mouth</b>
Current GPS Altitude (m)	<b>12.5</b>

Notes

Event: **Bio Bio River Mouth**Date/Time: **29/03/2010 18:46:48**Latitude/Longitude: **-73.173766,-36.812224**

Picture taken 29/03/10 18:49:45

**List of metadata**



Name	Value
Location	<b>Bio Bio River Mouth</b>
Current GPS Altitude (m)	<b>21.5</b>

Notes

ID: 156

Event: **Bio Bio River Mouth**Date/Time: **29/03/2010 18:53:19**Latitude/Longitude: **-73.1738,-36.81214**

Picture taken 29/03/10 18:53:24

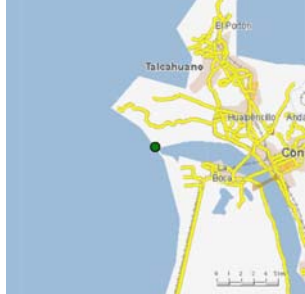

List of metadata	
Name	Value
Location	Bio Bio River Mouth
Current GPS Altitude (m)	23

Notes

ID: 157

Event: **Bio Bio River Mouth**Date/Time: **29/03/2010 19:00:58**Latitude/Longitude: **-73.17311,-36.80985**

Picture taken 29/03/10 19:01:02






List of metadata	
Name	Value
Location	Bio Bio River Mouth
Current GPS Altitude (m)	13.5

Notes

Event: **Concepcion (Juan Pablo II Bridge)**Date/Time: **29/03/2010 19:37:47**Latitude/Longitude: **-73.0841,-36.81375**

Picture taken 29/03/10 19:37:51



**List of metadata**

Name	Value
Location	Concepcion (Juan Pablo II Bridge)
Current GPS Altitude (m)	30.5

Notes

Event: **Concepcion (Ponte Liacolen)**Date/Time: **29/03/2010 19:45:28**Latitude/Longitude: **-73.06766,-36.83041**

Picture taken 29/03/10 19:45:35



**List of metadata**

Name	Value
Location	Concepcion (Ponte Liacolen)
Current GPS Altitude (m)	27

Notes

Event: **Concepcion (Ponte Liacolen)**Date/Time: **29/03/2010 19:46:29**Latitude/Longitude: **-73.06766,-36.83041**

Picture taken 29/03/10 19:46:35



**List of metadata**

Name	Value
Location	Concepcion (Ponte Liacolen)
Current GPS Altitude (m)	27

Notes

Event: **La Bocha, Talcahuano**Date/Time: **29/03/2010 20:03:45**Latitude/Longitude: **-73.11679,-36.84624**

Picture taken 29/03/10 20:03:50

**List of metadata**



Name	Value
Location	La Bocha, Talcahuano
Current GPS Altitude (m)	20.5

Notes



Event: **La Bocha, Talcahuano**Date/Time: **29/03/2010 20:04:21**Latitude/Longitude: **-73.11675,-36.84627**

Picture taken 29/03/10 20:04:25



**List of metadata**

Name	Value
Location	<b>La Bocha, Talcahuano</b>
Current GPS Altitude (m)	<b>19</b>

Notes

Event: **Lota: h=3.6**Date/Time: **29/03/2010 20:45:34**Latitude/Longitude: **-73.1425,-37.0614**

Picture taken 29/03/10 20:45:43


**List of metadata**

Name	Value
Location	<b>Lota</b>
Measured height (m)	<b>3.3</b>
Tide level (m)	<b>0.25</b>
Water Height (m)	<b>3.55</b>

Notes

Event: **Lota**Date/Time: **29/03/2010 21:04:08**Latitude/Longitude: **-73.14313,-37.06148**

extension of beach due to 1.7m uplift, 34 m




PTT 29/03/2010 21:04:08 (UTC+03:00)

List of metadata	
Name	Value
Location	<b>Lota</b>
Current GPS Altitude (m)	<b>14</b>

Notes

Event: **Laraquete (wav)**Date/Time: **29/03/2010 22:15:43**Latitude/Longitude: **-73.19144,-37.16757**

Picture taken 29/03/10 22:15:47




PTT 29/03/2010 22:15:43 (UTC+03:00)

List of metadata	
Name	Value
Location	<b>Laraquete</b>
Current GPS Altitude (m)	<b>11.5</b>

Notes

ID: 166

Event: **Laraquete (wav)**Date/Time: **29/03/2010 22:16:38**Latitude/Longitude: **-73.19147,-37.16756**

Picture taken 29/03/10 22:16:42




**List of metadata**


Name	Value
Location	<b>Laraquete</b>
Current GPS Altitude (m)	<b>9.5</b>

Notes

ID: 167

Event: **Concepcion**Date/Time: **29/03/2010 22:18:50**Latitude/Longitude: **-73.0459,-36.8255**

Comando de operaciones territorial



**List of metadata**

Name	Value
Location	<b>Concepcion</b>

Notes

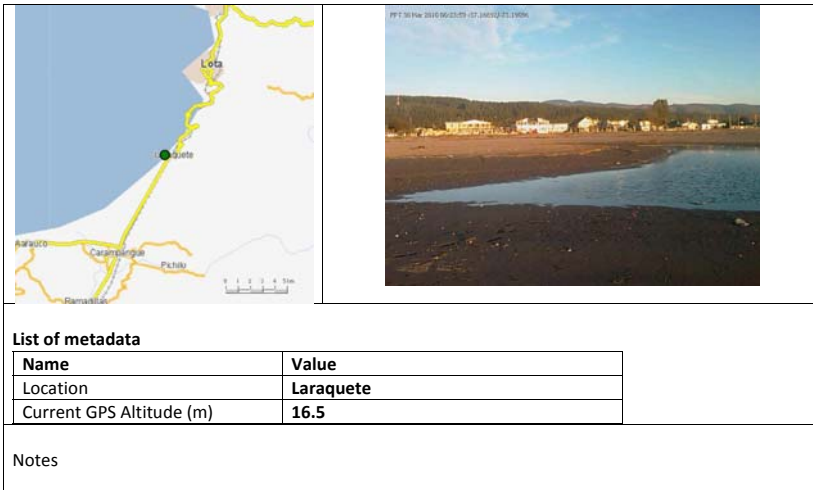
ID: 168

Event: **Laraquete**

Date/Time: 29/03/2010 22:23:59

Latitude/Longitude: -73.19096,-37.16692

Picture taken 29/03/10 22:24:04



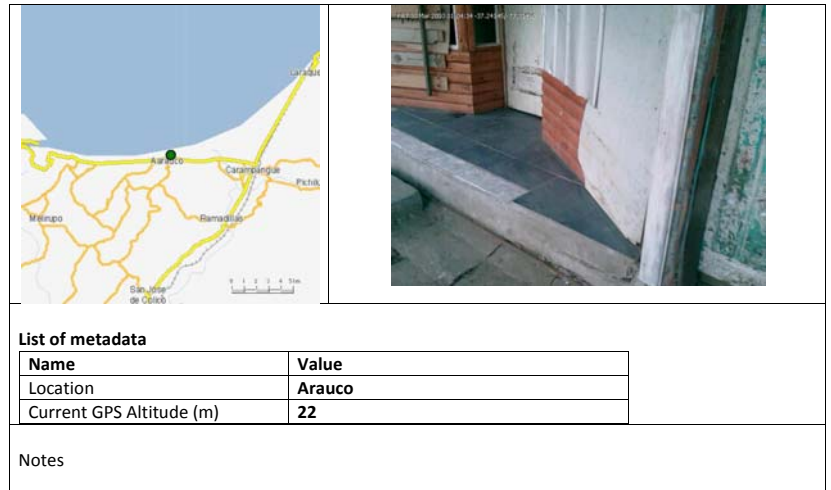
ID: 169

Event: Arauco

Date/Time: 29/03/2010 23:04:34



Latitude/Longitude: **-73.31496,-37.24145**

Picture taken 29/03/10 23:12:23



Event: **Arauco: h=3.2**

Date/Time: **29/03/2010 23:04:34**  
 Latitude/Longitude: **-73.31496,-37.24145**  
 Picture taken 29/03/10 23:12:23






List of metadata	
Name	Value
Location	<b>Arauco</b>
Measured height (m)	<b>2.3</b>
Tide level (m)	<b>0.9</b>
Water Height (m)	<b>3.2</b>
Current GPS Altitude (m)	<b>22</b>

Notes

Event: **Concepcion**

Date/Time: **29/03/2010 23:13:00**  
 Latitude/Longitude: **-73.0656,-36.7947**  
 Holiday Inn Hotel

List of metadata	
Name	Value
Location	<b>Concepcion</b>



Notes



ID: 172

Event: **Concepcion**

Date/Time: **30/03/2010 13:03:02**  
 Latitude/Longitude: **-73.06403,-36.79337**  
 Lara's team leaving to North



List of metadata	
Name	Value
Location	<b>Concepcion</b>
Current GPS Altitude (m)	<b>44</b>

Notes

ID: 173

Event: **Cerro Verde**

Date/Time: **30/03/2010 13:44:04**  
 Latitude/Longitude: **-72.9763,-36.70726**  
 Picture taken 30/03/10 13:44:14



List of metadata	
Name	Value
Location	<b>Cerro Verde</b>
Current GPS Altitude (m)	<b>74.5</b>

Notes

ID: 174

Event: **Tomé**

Date/Time: **30/03/2010 14:06:06**  
 Latitude/Longitude: **-72.95815,-36.62022**  
 Picture taken 30/03/10 14:06:10



List of metadata	
Name	Value
Location	Tomé
Current GPS Altitude (m)	33

Notes

ID: 175

Event: **Tomé**

Date/Time: **30/03/2010 14:10:38**  
 Latitude/Longitude: **-72.95842,-36.6199**  
 Picture taken 30/03/10 14:10:47






List of metadata	
Name	Value
Location	Tomé
Current GPS Altitude (m)	22

Notes

Event: **Tomé : h=4.6 (wav)**Date/Time: **30/03/2010 14:11:40**Latitude/Longitude: **-72.958333,-36.619769**

Picture taken 30/03/10 14:11:44



**List of metadata**

Name	Value
Location	<b>Tomé</b>
Measured height (m)	<b>2.9</b>
Tide level (m)	<b>1.69</b>
Water Height (m)	<b>4.59</b>
Horizontal Distance (m)	<b>16.00 M</b>
Current GPS Altitude (m)	<b>22</b>
Target Azimut (Degree)	<b>32.80 D</b>
Inclination (Degree)	<b>-3.30 D</b>
Current Latitude (Degree)	<b>-36.61989</b>
Target Latitude (Degree)	<b>-36.619769</b>
Target Longitude (Degree)	<b>-72.958333</b>

Notes

Event: **Tomé : h=4.6**Date/Time: **30/03/2010 14:11:40**Latitude/Longitude: **-72.958333,-36.619769**

Picture taken 30/03/10 14:11:44

**List of metadata**

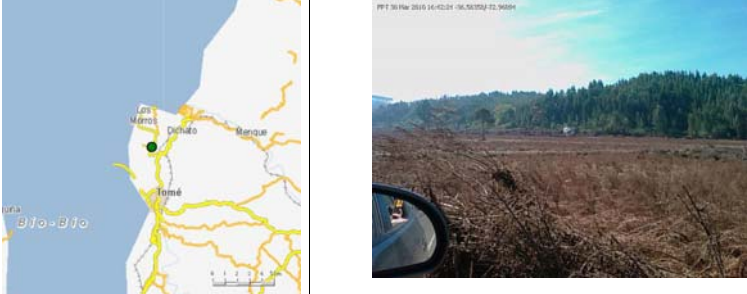
Name	Value
Location	<b>Tomé</b>
Measured height (m)	<b>2.9</b>
Tide level (m)	<b>1.69</b>
Water Height (m)	<b>4.59</b>
Horizontal Distance (m)	<b>16.00 M</b>
Current GPS Altitude (m)	<b>22</b>
Target Azimut (Degree)	<b>32.80 D</b>
Inclination (Degree)	<b>-3.30 D</b>
Current Latitude (Degree)	<b>-36.61989</b>
Target Latitude (Degree)	<b>-36.619769</b>
Target Longitude (Degree)	<b>-72.958333</b>

Notes

ID: 178

Event: **Coliumo**Date/Time: **30/03/2010 14:42:24**Latitude/Longitude: **-72.96094,-36.56358**

Picture taken 30/03/10 14:42:28



The left panel shows a map of the Coliumo area with a green dot indicating the location. The right panel shows a photograph of a dry, open field with a line of trees in the background. A car's side mirror is visible in the bottom left corner of the photo.


List of metadata	
Name	Value
Location	Coliumo
Current GPS Altitude (m)	25.5

Notes

ID: 179

Event: **Coliumo**Date/Time: **30/03/2010 14:44:15**Latitude/Longitude: **-72.95919,-36.56061**

Picture taken 30/03/10 14:44:19



The left panel shows a map of the Coliumo area with a green dot indicating the location. The right panel shows a photograph of a white boat on a grassy field with a line of trees in the background.



List of metadata	
Name	Value
Location	Coliumo
Current GPS Altitude (m)	24.5

Notes

ID: 180

Event: **Coliumo**Date/Time: **30/03/2010 14:45:05**Latitude/Longitude: **-72.95916,-36.5606**

Picture taken 30/03/10 14:45:09

**List of metadata**



Name	Value
Location	<b>Coliumo</b>
Current GPS Altitude (m)	<b>24</b>

Notes

ID: 181

Event: **Coliumo: h=8.6**Date/Time: **30/03/2010 14:49:19**Latitude/Longitude: **-72.959565,-36.560301**

Base of the boat

**List of metadata**


Name	Value
Location	<b>Coliumo</b>
Measured height (m)	<b>6.9</b>
Tide level (m)	<b>1.73</b>
Water Height (m)	<b>8.63</b>
Horizontal Distance (m)	<b>51.30 M</b>
Current GPS Altitude (m)	<b>30</b>
Target Azimut (Degree)	<b>313.80 D</b>
Inclination (Degree)	<b>5.20 D</b>
Current Latitude (Degree)	<b>-36.56062</b>
Target Latitude (Degree)	<b>-36.560301</b>
Target Longitude (Degree)	<b>-72.959565</b>

Notes



Event: **Coliumo: h=9.5**Date/Time: **30/03/2010 14:53:25**Latitude/Longitude: **-72.959665,-36.560438**

Picture taken 30/03/10 14:53:29




The left panel shows a map of the Coliumo area with a green dot indicating the measurement location. The right panel is a photograph of a dirt road with a fence and trees in the background.

List of metadata	
Name	Value
Location	Coliumo
Measured height (m)	7.8
Tide level (m)	1.73
Water Height (m)	9.53
Horizontal Distance (m)	49.01 M
Current GPS Altitude (m)	23.5
Target Azimut (Degree)	293.00 D
Inclination (Degree)	6.50 D
Current Latitude (Degree)	-36.56061
Target Latitude (Degree)	-36.560438
Target Longitude (Degree)	-72.959665

Notes

Event: **Coliumo: h=9.8**Date/Time: **30/03/2010 14:55:23**Latitude/Longitude: **-72.95916,-36.56062**

Picture taken 30/03/10 14:55:33





The left panel shows a map of the Coliumo area with a green dot indicating the measurement location. The right panel is a photograph of a dirt road with a fence and trees in the background.

List of metadata	
Name	Value
Location	Coliumo
Measured height (m)	8.1
Tide level (m)	1.74
Water Height (m)	9.84
Horizontal Distance (m)	65.50 M
Current GPS Altitude (m)	22
Target Azimut (Degree)	263.50 D
Inclination (Degree)	5.10 D
Current Latitude (Degree)	-36.56062
Target Latitude (Degree)	-36.560687
Target Longitude (Degree)	-72.959889

Notes

Event: **Coliumo**Date/Time: **30/03/2010 14:59:26**Latitude/Longitude: **-72.95917,-36.56063**

Picture taken 30/03/10 14:59:30



**List of metadata**

Name	Value
Location	<b>Coliumo</b>
Current GPS Altitude (m)	<b>23</b>

Notes

Event: **Coliumo: h=9.2**Date/Time: **30/03/2010 15:15:12**Latitude/Longitude: **-72.95705,-36.556105**

Picture taken 30/03/10 15:15:16

**List of metadata**



Name	Value
Location	<b>Coliumo</b>
Measured height (m)	<b>7.5</b>
Tide level (m)	<b>1.72</b>
Water Height (m)	<b>9.22</b>
Horizontal Distance (m)	<b>11.20 M</b>
Current GPS Altitude (m)	<b>23</b>
Target Azimut (Degree)	<b>198.80 D</b>
Inclination (Degree)	<b>0.20 D</b>
Current Latitude (Degree)	<b>-36.55601</b>
Target Latitude (Degree)	<b>-36.556105</b>
Target Longitude (Degree)	<b>-72.95705</b>

Notes

ID: 186

Event: **Coliumo**Date/Time: **30/03/2010 15:20:58**Latitude/Longitude: **-72.956745,-36.55653**



Picture taken 30/03/10 15:21:03

					
<b>List of metadata</b> <table border="1"> <tr> <th>Name</th> <th>Value</th> </tr> <tr> <td>Location</td> <td>Coliumo</td> </tr> </table>		Name	Value	Location	Coliumo
Name	Value				
Location	Coliumo				
Notes					

ID: 187

Event: **Coliumo**Date/Time: **30/03/2010 15:22:34**Latitude/Longitude: **-72.95671,-36.55634**

Picture taken 30/03/10 15:22:44

					
<b>List of metadata</b> <table border="1"> <tr> <th>Name</th> <th>Value</th> </tr> <tr> <td>Location</td> <td>Coliumo</td> </tr> </table>		Name	Value	Location	Coliumo
Name	Value				
Location	Coliumo				
Notes					



ID: 188

Event: **Coliumo**

Date/Time: **30/03/2010 15:34:22**

Latitude/Longitude: **-72.956623,-36.559039**

Picture taken 30/03/10 15:34:26

	
<b>List of metadata</b>	
<b>Name</b>	<b>Value</b>
Location	Coliumo
Notes	



ID: 189

Event: **Coliumo**

Date/Time: **30/03/2010 15:35:32**

Latitude/Longitude: **-72.95677,-36.55872**

base of boat, bottom

	
<b>List of metadata</b>	
<b>Name</b>	<b>Value</b>
Location	Coliumo
Notes	



Event: **Coliumo (wav)**Date/Time: **30/03/2010 15:44:02**Latitude/Longitude: **-72.95724,-36.556**

At about 3:40 we were sleeping and felt a large movement that ever felt before. My wife started to scream to run out and escape because the house could not have sustained. It is difficult to explain and describe.

at 4:10 (+0:36) the first wave of 3 waves. We could not see anything, only the noise that was carrying away all what found on his track. At 4:30 (+0:56) the wave receded back destroying a lot.

The third one has been the most destructive at 6:40 (+3:06). The sea was receding a lot and then created a sea wall. I cannot say how big could be but it was so fast, we could say 300-400 km/h (note: this is impossible speed but it indicates that it was much faster than conceivable for a sea wave). There were boats, houses and containers floating. Before the arrival of the third wave, it was completely empty, no water at all.



The end of the process of waves finished at about 6 in the afternoon but the waves were not so high.

List of metadata	
Name	Value
Location	Coliumo

Event: **Coliumo (wav)**Date/Time: **30/03/2010 15:48:12**Latitude/Longitude: **-72.95723,-36.556**

Picture taken 30/03/10 15:48:16

List of metadata	
Name	Value
Location	Coliumo





ID: 192

Event: **Coliumo (wav)**

Date/Time: **30/03/2010 15:50:43**

Latitude/Longitude: **-72.95724,-36.556**

Picture taken 30/03/10 15:50:48



**List of metadata**

Name	Value
Location	Coliumo

Notes



ID: 193

Event: **Coliumo (wav)**

Date/Time: **30/03/2010 15:53:14**

Latitude/Longitude: **-72.95724,-36.556**

Picture taken 30/03/10 15:53:18



**List of metadata**

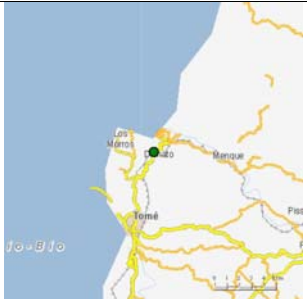

Name	Value
Location	Coliumo

Notes

ID: 194

Event: **Dichato: h=9.5**

Date/Time: **30/03/2010 15:55:33**  
 Latitude/Longitude: **-72.93698,-36.54675**  
 Picture taken 3/30/10 2:44:34 PM

**List of metadata**

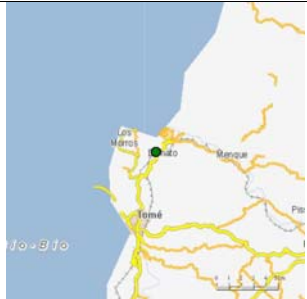

Name	Value
Location	<b>Dichato</b>
Measured height (m)	<b>8.2</b>
Tide level (m)	<b>1.34</b>
Water Height (m)	<b>9.54</b>
Current GPS Altitude (m)	<b>23</b>

Notes

ID: 195

Event: **Dichato: h=6.8**

Date/Time: **30/03/2010 16:55:49**  
 Latitude/Longitude: **-72.93865,-36.54763**  
 Picture taken 3/30/10 5:12:19 PM



**List of metadata**

Name	Value
Location	<b>Dichato</b>
Measured height (m)	<b>5.5</b>
Tide level (m)	<b>1.25</b>
Water Height (m)	<b>6.75</b>
Horizontal Distance (m)	<b>26.00 M</b>
Current GPS Altitude (m)	<b>-4.4</b>
Target Azimut (Degree)	<b>215.70 D</b>
Inclination (Degree)	<b>-2.90 D</b>
Current Latitude (Degree)	<b>-36.54744</b>
Target Latitude (Degree)	<b>-36.54763</b>
Target Longitude (Degree)	<b>-72.93865</b>

Notes

Event: **Dichato: h=8.6**

Date/Time: **30/03/2010 16:57:02**  
 Latitude/Longitude: **-72.93652,-36.54747**  
 Picture taken 3/30/10 2:55:56 PM



**List of metadata**

Name	Value
Location	<b>Dichato</b>
Measured height (m)	<b>7.3</b>
Tide level (m)	<b>1.33</b>
Water Height (m)	<b>8.63</b>

Notes

Event: **Dichato: h=9.5**

Date/Time: **30/03/2010 17:00:02**  
 Latitude/Longitude: **-72.93706,-36.54691**  
 Picture taken 3/30/10 2:59:49 PM



**List of metadata**

Name	Value
Location	<b>Dichato</b>
Measured height (m)	<b>8.2</b>
Tide level (m)	<b>1.3</b>
Water Height (m)	<b>9.5</b>

Notes

Event: **Dichato: h=4.9**Date/Time: **30/03/2010 17:01:19**Latitude/Longitude: **-72.938411,-36.547455**

Picture taken 3/30/10 4:59:36 PM

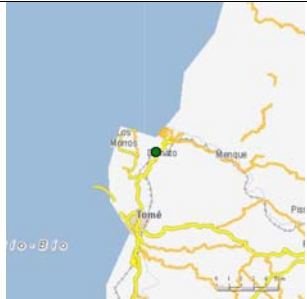




List of metadata	
Name	Value
Location	<b>Dichato</b>
Measured height (m)	<b>3.6</b>
Tide level (m)	<b>1.27</b>
Water Height (m)	<b>4.87</b>
Horizontal Distance (m)	<b>12.90 M</b>
Current GPS Altitude (m)	<b>-4.4</b>
Target Azimut (Degree)	<b>124.20 D</b>
Inclination (Degree)	<b>3.80 D</b>
Current Latitude (Degree)	<b>-36.54739</b>
Target Latitude (Degree)	<b>-36.547455</b>
Target Longitude (Degree)	<b>-72.938411</b>

Notes

Event: **Dichato: h=5.7**Date/Time: **30/03/2010 17:15:56**Latitude/Longitude: **-72.93848,-36.54744**

Picture taken 3/30/10 5:15:07 PM

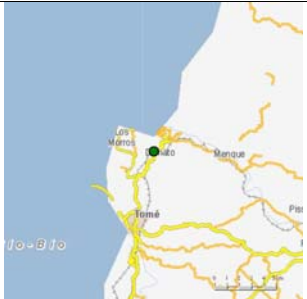




List of metadata	
Name	Value
Location	<b>Dichato</b>
Measured height (m)	<b>4.5</b>
Tide level (m)	<b>1.24</b>
Water Height (m)	<b>5.74</b>
Horizontal Distance (m)	<b>13.40 M</b>
Current GPS Altitude (m)	<b>-10.9</b>
Target Azimut (Degree)	<b>117.60 D</b>
Inclination (Degree)	<b>4.00 D</b>
Current Latitude (Degree)	<b>-36.54744</b>
Target Latitude (Degree)	<b>-36.547496</b>
Target Longitude (Degree)	<b>-72.938357</b>

Notes

Event: **Dichato: h=5.8**Date/Time: **30/03/2010 17:21:25**Latitude/Longitude: **-72.938012,-36.547909**

Picture taken 3/30/10 5:20:31 PM

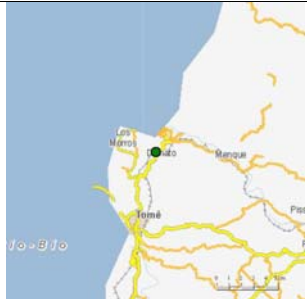

FRT 30 Mar 2010 18:20:26 -36.547909/-72.938012

List of metadata	
Name	Value
Location	Dichato
Measured height (m)	4.6
Tide level (m)	1.22
Water Height (m)	5.82
Horizontal Distance (m)	43.50 M
Current GPS Altitude (m)	-4.3
Target Azimut (Degree)	142.20 D
Inclination (Degree)	1.70 D
Current Latitude (Degree)	-36.5476
Target Latitude (Degree)	-36.547909
Target Longitude (Degree)	-72.938012

Notes

Event: **Dichato: h=5.8**Date/Time: **30/03/2010 17:23:20**Latitude/Longitude: **-72.93796,-36.547576**

Picture taken 3/30/10 5:22:19 PM

FRT 30 Mar 2010 18:22:14 -36.547576/-72.93796



List of metadata	
Name	Value
Location	Dichato
Measured height (m)	4.6
Tide level (m)	1.22
Water Height (m)	5.82
Horizontal Distance (m)	33.60 M
Current GPS Altitude (m)	-2
Target Azimut (Degree)	106.60 D
Inclination (Degree)	2.30 D
Current Latitude (Degree)	-36.54749
Target Latitude (Degree)	-36.547576
Target Longitude (Degree)	-72.93796

Notes



Event: **Santiago**

Date/Time: **31/03/2010 00:23:59**  
Latitude/Longitude: **-70.60362,-33.4126**  
hotel interc 731



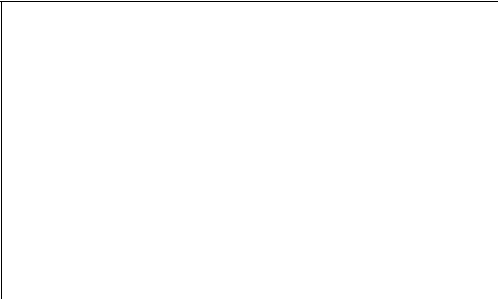

List of metadata

Name	Value
Location	Santiago
Current GPS Altitude (m)	649.5

Notes

Event: **Santiago**

Date/Time: **31/03/2010 14:23:58**  
Latitude/Longitude: **-70.6113,-33.4273**  
Hotel Neruda



List of metadata

Name	Value
Location	Santiago









Notes









## Mission Report









*Mission: Full Mission Angelika*









Pictures taken by Angelika






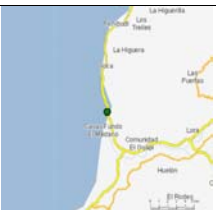




Picture	Details	Reference Map
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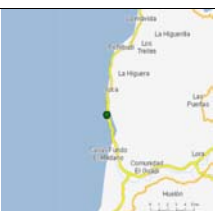
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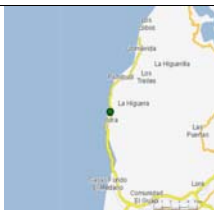

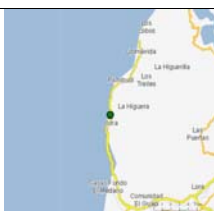
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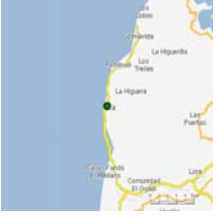




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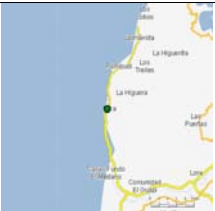

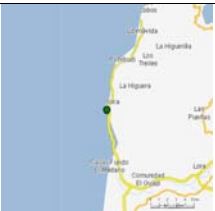
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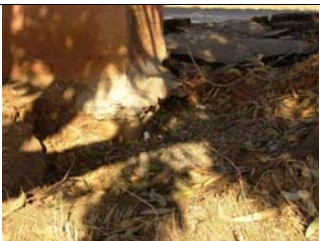



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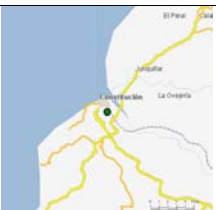


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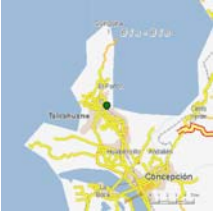


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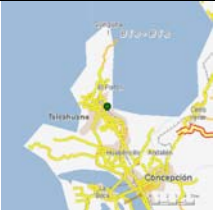














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	ID: DSCN2452 Date/Time: <b>29/03/2010 13:34:53</b> Latitude/Longitude: - <b>73.10426,-36.7248</b>	









	ID: DSCN2453 Date/Time: <b>29/03/2010 13:35:07</b> Latitude/Longitude: - <b>73.10426,-36.7248</b>	
	ID: DSCN2454 Date/Time: <b>29/03/2010 13:40:33</b> Latitude/Longitude: - <b>73.10429,-36.72476</b>	
	ID: DSCN2455 Date/Time: <b>29/03/2010 13:45:43</b> Latitude/Longitude: - <b>73.10411,-36.724</b>	
	ID: DSCN2456 Date/Time: <b>29/03/2010 13:55:09</b> Latitude/Longitude: - <b>73.10434,-36.72356</b>	









	<p>ID: DSCN2457  Date/Time: <b>29/03/2010 13:56:50</b>  Latitude/Longitude: -  <b>73.10434,-36.72356</b></p>	
	<p>ID: DSCN2458  Date/Time: <b>29/03/2010 14:24:01</b>  Latitude/Longitude: -  <b>73.1047,-36.72503</b></p>	
	<p>ID: DSCN2459  Date/Time: <b>29/03/2010 15:15:43</b>  Latitude/Longitude: -  <b>73.11101,-36.71618</b></p>	
	<p>ID: DSCN2460  Date/Time: <b>29/03/2010 15:16:21</b>  Latitude/Longitude: -  <b>73.11127,-36.71554</b></p>	









	<p>ID: DSCN2461  Date/Time: <b>29/03/2010 15:23:35</b>  Latitude/Longitude: -  <b>73.11471,-36.70993</b></p>	
	<p>ID: DSCN2462  Date/Time: <b>29/03/2010 15:24:41</b>  Latitude/Longitude: -  <b>73.11473,-36.70975</b></p>	
	<p>ID: DSCN2463  Date/Time: <b>29/03/2010 15:24:54</b>  Latitude/Longitude: -  <b>73.11473,-36.70975</b></p>	
	<p>ID: DSCN2464  Date/Time: <b>29/03/2010 16:51:55</b>  Latitude/Longitude: -  <b>73.11476,-36.71136</b></p>	











	ID: DSCN2465 Date/Time: <b>29/03/2010 16:52:12</b> Latitude/Longitude: - <b>73.11477,-36.71145</b>	
	ID: DSCN2466 Date/Time: <b>29/03/2010 16:53:24</b> Latitude/Longitude: - <b>73.11484,-36.71155</b>	
	ID: DSCN2467 Date/Time: <b>29/03/2010 16:55:18</b> Latitude/Longitude: - <b>73.11514,-36.71185</b>	
	ID: DSCN2468 Date/Time: <b>29/03/2010 16:55:34</b> Latitude/Longitude: - <b>73.11531,-36.71211</b>	









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	ID: DSCN2472 Date/Time: <b>29/03/2010 19:45:04</b> Latitude/Longitude: - <b>73.06771,-36.83039</b>	
	ID: DSCN2473 Date/Time: <b>29/03/2010 19:45:30</b> Latitude/Longitude: - <b>73.06771,-36.83039</b>	









	<p>ID: DSCN2474  Date/Time: <b>29/03/2010 19:45:44</b>  Latitude/Longitude: -  <b>73.06771,-36.83039</b></p>	
	<p>ID: FSCN2476  Date/Time: <b>29/03/2010 19:46:06</b>  Latitude/Longitude: -  <b>73.06771,-36.83039</b></p>	
	<p>ID: DSCN2475  Date/Time: <b>29/03/2010 19:46:06</b>  Latitude/Longitude: -  <b>73.06771,-36.83039</b></p>	
	<p>ID: DSCN2477  Date/Time: <b>29/03/2010 20:02:27</b>  Latitude/Longitude: -  <b>73.11672,-36.84628</b></p>	









	<p>ID: DSCN2478  Date/Time: <b>29/03/2010 20:49:20</b>  Latitude/Longitude: -  <b>73.14305,-37.06154</b></p>	
	<p>ID: DSCN2479  Date/Time: <b>29/03/2010 20:50:46</b>  Latitude/Longitude: -  <b>73.14308,-37.06151</b></p>	
	<p>ID: DSCN2480  Date/Time: <b>29/03/2010 21:30:47</b>  Latitude/Longitude: -  <b>73.15114,-37.07715</b></p>	
	<p>ID: DSCN2482  Date/Time: <b>29/03/2010 21:32:43</b>  Latitude/Longitude: -  <b>73.15937,-37.08098</b></p>	






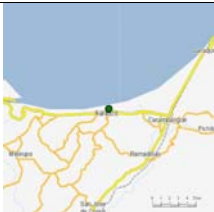







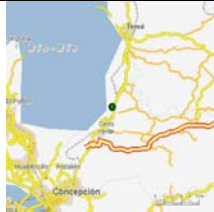




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	ID: DSCN2487 Date/Time: <b>29/03/2010 21:36:24</b> Latitude/Longitude: - <b>73.16202,-37.08742</b>	
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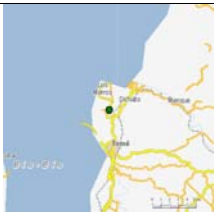
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	<p>ID: DSCN2498  Date/Time: <b>29/03/2010 23:05:02</b>  Latitude/Longitude: -  <b>73.31503,-37.24154</b></p>	







	<p>ID: DSCN2499  Date/Time: <b>29/03/2010 23:10:19</b>  Latitude/Longitude: -  <b>73.31503,-37.24154</b></p>	
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	ID: DSCN2532 Date/Time: <b>30/03/2010 16:47:45</b> Latitude/Longitude: - <b>72.9389,-36.5472</b>	
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	ID: DSCN2537 Date/Time: <b>30/03/2010 16:50:46</b> Latitude/Longitude: - <b>72.9389,-36.5472</b>	
	ID: DSCN2538 Date/Time: <b>30/03/2010 16:51:03</b> Latitude/Longitude: - <b>72.9389,-36.5472</b>	
	ID: DSCN2539 Date/Time: <b>30/03/2010 16:51:47</b> Latitude/Longitude: - <b>72.9389,-36.5472</b>	









	ID: DSCN2540 Date/Time: <b>30/03/2010 16:52:38</b> Latitude/Longitude: - <b>72.9389,-36.5472</b>	
	ID: DSCN2541 Date/Time: <b>30/03/2010 16:53:00</b> Latitude/Longitude: - <b>72.9389,-36.5472</b>	
	ID: DSCN2542 Date/Time: <b>30/03/2010 16:54:19</b> Latitude/Longitude: - <b>72.9389,-36.5472</b>	
	ID: DSCN2543 Date/Time: <b>30/03/2010 16:58:12</b> Latitude/Longitude: - <b>72.9386,-36.5474</b>	









	ID: DSCN2544 Date/Time: <b>30/03/2010 17:07:31</b> Latitude/Longitude: - <b>72.9387,-36.5474</b>	
	ID: DSCN2545 Date/Time: <b>30/03/2010 17:08:15</b> Latitude/Longitude: - <b>72.9387,-36.5474</b>	
	ID: DSCN2546 Date/Time: <b>30/03/2010 17:09:20</b> Latitude/Longitude: - <b>72.939,-36.5473</b>	
	ID: DSCN2547 Date/Time: <b>30/03/2010 17:10:00</b> Latitude/Longitude: - <b>72.939,-36.5473</b>	



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	<p>ID: DSCN2549  Date/Time: <b>30/03/2010 17:11:18</b>  Latitude/Longitude: -  <b>72.9385,-36.5475</b></p>	
	<p>ID: DSCN2550  Date/Time: <b>30/03/2010 17:34:25</b>  Latitude/Longitude: -  <b>72.93796,-36.547576</b></p>	
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	<p>ID: DSCN2554  Date/Time: <b>30/03/2010 17:36:10</b>  Latitude/Longitude: -  <b>72.93796,-36.547576</b></p>	
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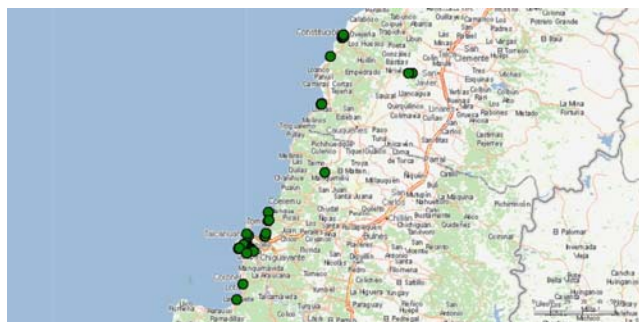
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	<p>ID: DSCN2562  Date/Time: <b>30/03/2010 17:55:17</b>  Latitude/Longitude: -  <b>72.9366,-36.5475</b></p>	
	<p>ID: DSCN2563  Date/Time: <b>30/03/2010 18:02:00</b>  Latitude/Longitude: -  <b>72.9382,-36.5471</b></p>	











	<p>ID: DSCN2564 Date/Time: <b>30/03/2010 18:02:11</b> Latitude/Longitude: - <b>72.9382,-36.5471</b></p>	
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	<p>ID: DSCN2566 Date/Time: <b>30/03/2010 19:04:22</b> Latitude/Longitude: - <b>72.9543,-36.614</b></p>	









## Mission Report

*Mission: Full\_Mission\_Nikon*







Picture	Details	Reference Map
	ID: DSCN3872 Date/Time: <b>28/03/2010 12:12:04</b> Latitude/Longitude: - <b>71.90322,-35.58936</b>	
	ID: DSCN3873 Date/Time: <b>28/03/2010 12:15:32</b> Latitude/Longitude: - <b>71.93201,-35.59174</b>	
	ID: DSCN3874 Date/Time: <b>28/03/2010 12:15:36</b> Latitude/Longitude: - <b>71.93201,-35.59174</b>	
	ID: DSCN3875 Date/Time: <b>28/03/2010 12:15:54</b> Latitude/Longitude: - <b>71.93201,-35.59174</b>	









	<p>ID: DSCN3876  Date/Time: <b>28/03/2010 12:17:10</b>  Latitude/Longitude: -  <b>71.93201,-35.59174</b></p>	
	<p>ID: DSCN3877  Date/Time: <b>28/03/2010 13:06:04</b>  Latitude/Longitude: -  <b>72.41788,-35.34419</b></p>	
	<p>ID: DSCN3878  Date/Time: <b>28/03/2010 13:06:10</b>  Latitude/Longitude: -  <b>72.41788,-35.34419</b></p>	
	<p>ID: DSCN3879  Date/Time: <b>28/03/2010 13:06:26</b>  Latitude/Longitude: -  <b>72.41788,-35.34419</b></p>	









	<p>ID: DSCN3880  Date/Time: <b>28/03/2010 13:06:34</b>  Latitude/Longitude: -  <b>72.41788,-35.34419</b></p>	
	<p>ID: DSCN3881  Date/Time: <b>28/03/2010 13:11:10</b>  Latitude/Longitude: -  <b>72.41789,-35.33129</b></p>	
	<p>ID: DSCN3882  Date/Time: <b>28/03/2010 13:13:28</b>  Latitude/Longitude: -  <b>72.41762,-35.33157</b></p>	
	<p>ID: DSCN3883  Date/Time: <b>28/03/2010 13:18:58</b>  Latitude/Longitude: -  <b>72.41241,-35.3315</b></p>	

	<p>ID: DSCN3884</p> <p>Date/Time: <b>28/03/2010 13:19:22</b></p> <p>Latitude/Longitude: - <b>72.41241,-35.3315</b></p>	
	<p>ID: DSCN3885</p> <p>Date/Time: <b>28/03/2010 13:20:00</b></p> <p>Latitude/Longitude: - <b>72.41182,-35.33124</b></p>	
	<p>ID: DSCN3886</p> <p>Date/Time: <b>28/03/2010 13:22:20</b></p> <p>Latitude/Longitude: - <b>72.4078,-35.32966</b></p>	
	<p>ID: DSCN3887</p> <p>Date/Time: <b>28/03/2010 13:25:34</b></p> <p>Latitude/Longitude: - <b>72.40611,-35.3349</b></p>	









	<p>ID: DSCN3888</p> <p>Date/Time: <b>28/03/2010 13:25:46</b></p> <p>Latitude/Longitude: - <b>72.40603,-35.33497</b></p>	
	<p>ID: DSCN3889</p> <p>Date/Time: <b>28/03/2010 13:26:02</b></p> <p>Latitude/Longitude: - <b>72.40591,-35.33519</b></p>	
	<p>ID: DSCN3890</p> <p>Date/Time: <b>28/03/2010 13:26:08</b></p> <p>Latitude/Longitude: - <b>72.40572,-35.33552</b></p>	
	<p>ID: DSCN3891</p> <p>Date/Time: <b>28/03/2010 13:28:34</b></p> <p>Latitude/Longitude: - <b>72.40461,-35.33733</b></p>	



















	<p>ID: DSCN3892  Date/Time: <b>28/03/2010 14:23:40</b>  Latitude/Longitude: -  <b>72.405,-35.33458</b></p>	
	<p>ID: DSCN3893  Date/Time: <b>28/03/2010 15:09:08</b>  Latitude/Longitude: -  <b>72.40879,-35.32458</b></p>	
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	<p>ID: DSCN3897  Date/Time: <b>28/03/2010 15:10:04</b>  Latitude/Longitude: -  <b>72.40879,-35.32458</b></p>	
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	<p>ID: DSCN3900  Date/Time: <b>28/03/2010 15:14:24</b>  Latitude/Longitude: -  <b>72.4089,-35.32411</b></p>	
	<p>ID: DSCN3901  Date/Time: <b>28/03/2010 15:21:54</b>  Latitude/Longitude: -  <b>72.40892,-35.32455</b></p>	
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	<p>ID: DSCN3908  Date/Time: <b>28/03/2010 17:26:10</b>  Latitude/Longitude: -  <b>72.56838,-35.80449</b></p>	
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	<p>ID: DSCN3916  Date/Time: <b>28/03/2010 17:33:18</b>  Latitude/Longitude: -  <b>72.56942,-35.80337</b></p>	
	<p>ID: DSCN3917  Date/Time: <b>28/03/2010 17:48:48</b>  Latitude/Longitude: -  <b>72.56849,-35.80155</b></p>	
	<p>ID: DSCN3918  Date/Time: <b>28/03/2010 17:48:54</b>  Latitude/Longitude: -  <b>72.56849,-35.80155</b></p>	
	<p>ID: DSCN3919  Date/Time: <b>28/03/2010 17:49:46</b>  Latitude/Longitude: -  <b>72.56867,-35.80174</b></p>	

	<p>ID: DSCN3920  Date/Time: <b>28/03/2010 18:03:14</b>  Latitude/Longitude: -  <b>72.56951,-35.80559</b></p>	
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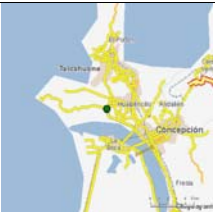

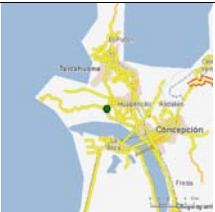


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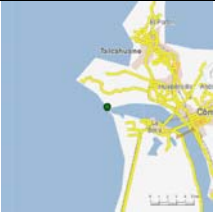

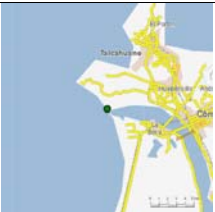

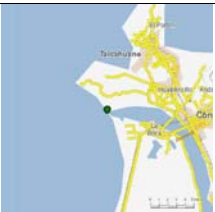
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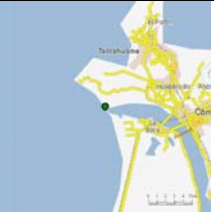

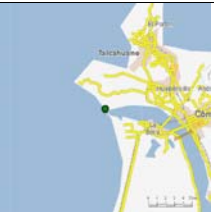

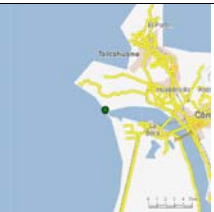
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	<p>ID: DSCN3948  Date/Time: <b>29/03/2010 17:24:33</b>  Latitude/Longitude: -  <b>73.1392,-36.78543</b></p>	
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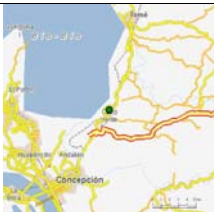
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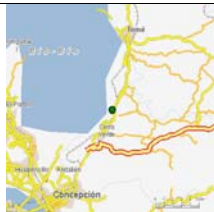
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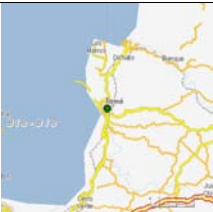


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## Mission Report









*Mission: Full\_Mission\_Ricoh*









All pictures taken with Ricoh camera











Picture	Details	Reference Map
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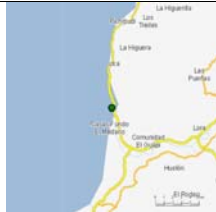





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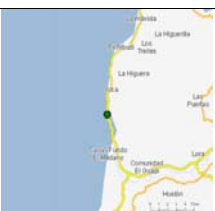









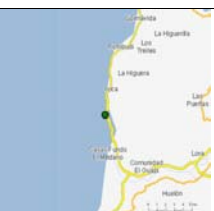
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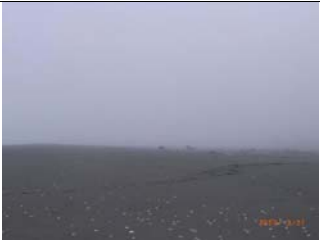







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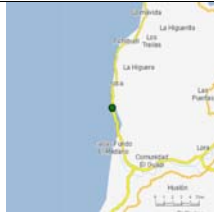

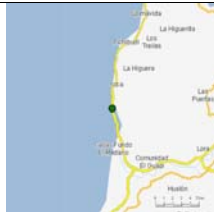

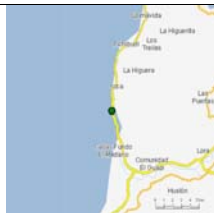


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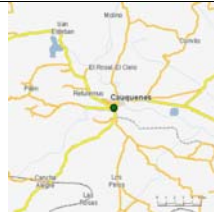

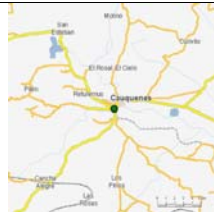

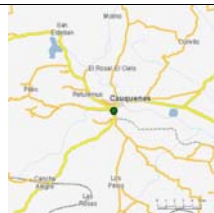

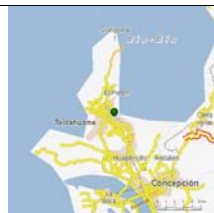
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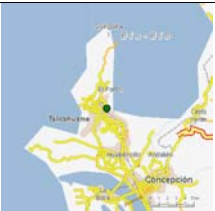

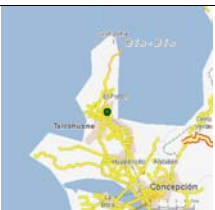

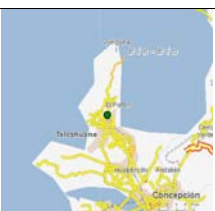
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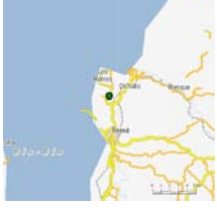

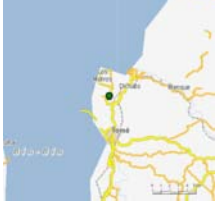
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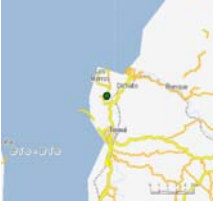

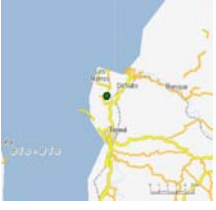

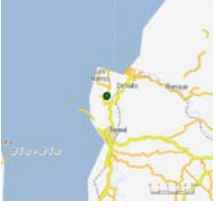
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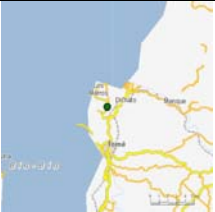

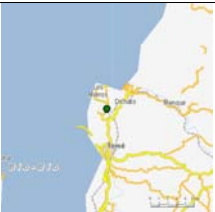

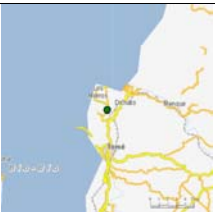







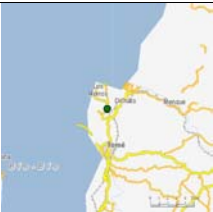
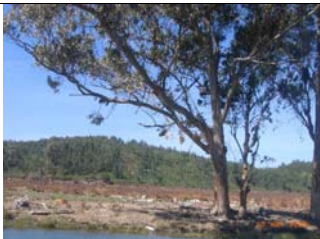
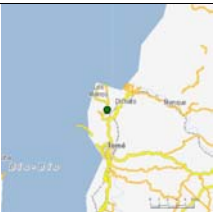
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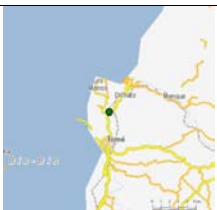


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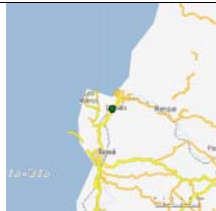




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	ID: R0011763 Date/Time: <b>30/03/2010 17:42:52</b> Latitude/Longitude: - <b>72.937131,-36.546969</b>	
	ID: R0011764 Date/Time: <b>30/03/2010 17:50:52</b> Latitude/Longitude: - <b>72.936917,-36.546736</b>	
	ID: R0011765 Date/Time: <b>30/03/2010 17:53:26</b> Latitude/Longitude: - <b>72.93685,-36.547131</b>	
	ID: R0011766 Date/Time: <b>30/03/2010 17:58:00</b> Latitude/Longitude: - <b>72.937028,-36.546881</b>	

	ID: R0011767 Date/Time: <b>30/03/2010 17:59:16</b> Latitude/Longitude: - <b>72.937147,-36.546875</b>	
	ID: R0011768 Date/Time: <b>30/03/2010 18:00:09</b> Latitude/Longitude: - <b>72.937164,-36.546856</b>	
	ID: R0011769 Date/Time: <b>30/03/2010 18:00:31</b> Latitude/Longitude: - <b>72.937369,-36.546917</b>	
	ID: R0011770 Date/Time: <b>30/03/2010 18:01:24</b> Latitude/Longitude: - <b>72.937975,-36.547042</b>	

	ID: R0011771 Date/Time: <b>30/03/2010 18:01:35</b> Latitude/Longitude: - <b>72.937958,-36.547047</b>	
	ID: R0011773 Date/Time: <b>30/03/2010 18:11:12</b> Latitude/Longitude: - <b>72.93865,-36.552297</b>	
	ID: R0011772 Date/Time: <b>30/03/2010 18:11:12</b> Latitude/Longitude: - <b>72.93865,-36.552297</b>	
	ID: R0011774 Date/Time: <b>30/03/2010 18:11:21</b> Latitude/Longitude: - <b>72.938922,-36.553417</b>	

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**Abstract**

This report describes the tsunami survey performed in Chile, 1 month after the 27 February 2010 Mw 8.8 Chile earthquake. The survey was done in the frame of the International Tsunami Survey Team in Chile (ITST-Chile), under the UNESCO coordination.

The primary aim was to collect data for assessing the accuracy of tsunami inundation models and to understand the complex nearshore wave dynamics that may affect tsunami inundation and run-up as those relate to damages on buildings, infrastructure and the natural environment.

The report also describes the methodology followed during the survey and the background information necessary to understand the measurements collected during the survey; a brief description of the Field Reporting Tool, used during the mission, is included.

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